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An International Review of Forestry and Forest Products

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Cover photograph : The dry forest of the Gold Coast is important for local supplies of wood to the inhabitants of the area. The Forestry Department's work is devoted to securing these supplies for the increasing population, including the protection of the tree cover from bush fires and uncontrolled grazing. (Photograph by courtesy of British Information Services.)

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Editorial

THE BIGGEST DEVELOPMENT OF OUR TIME

It is a little over one year since the United Nations launched the new Expanded Technical Assistance Program whose origins have already been traced in *Unasylva.* (Issue for Oct.-Dec. 1950).

The missions of technical experts engaged on this program are already in touch with problems which will have to be faced during a long period of sustained activity—problems of techniques, science, administration, social adjustment and finance.

The success of the Program will, in the long view, be judged by the progress made in implementing the recommendations of the experts sent out under the Program. It is important that everything should be done to put these experts in a position to make wise recommendations, based on the best access to existing knowledge. Of equal importance is the creation in countries receiving technical assistance of conditions which will make possible the implementation of the recommendations of the experts. This, too, requires access to knowledge and technical information.

One step in this direction is to make known the kinds of research in forestry and forest products that are being conducted throughout the world. To this end FAO will shortly distribute a document summarizing all the major lines of research in these fields being undertaken by the U.S. Forest Service, and it is hoped that this can be followed by current reporting of research in other countries and regions.

The magnitude of the whole technical assistance effort, both the programs of the United Nations and its specialized agencies and of individual countries, may best be judged by the Director-General's statement in his annual report for the year 1950/51. He believes that the technical assistance movement, which FAO helped to foster, will prove to be the most significant development of our life time.

" I believe, " he says, " it can effectively counteract the forces that work to undermine freedom and threaten world peace. Those forces operate best in an atmosphere of poverty, frustration and injustice. They do not thrive in an atmosphere of expanding opportunity for common men.

" This is essentially a movement to wipe out mass hunger and lift the burden of hopeless poverty from men's shoulders by applying modern scientific knowledge to the development of the earth's resources. It is a far more fundamental solution of the world's ills than the military and political preoccupations that now absorb so much of the attention of governments.

" If the drive for economic development and expanded opportunity grows as it should, it will make this period in which we live like the great age of exploration, when adventurous men roamed the seas and discovered new worlds, initiating the westward movement that opened up the vast North American continent. Those movements stirred the imagination of men and focussed their energies on great creative achievements. The same thing can happen again, and I believe it is beginning to happen now. "

One of the current jobs on the Gold Coast is to prevent wholesale destruction of forests through fires and sh ft-ing cultivation, although, pending the introduction of better methods of farming, the latter must continue outside the reserved forests. A typical roadside temporary plantation is seen above.

In Tanganyika Territory, cypress plantations such as that below, are formed with the aid of temporary cultiva-tion. Lining out a plantation has just finished in the foreground; a four year old plantation is behind. (Photos by courtesy of the Imperial Forestry Institute, Oxford.)

Better Conditions for Rural Populations in Tropical Forest Areas

By P. ALLOUARD

Conservator of Waters and Forests and Technical Director of the National Committee for Tropical Timbers, Paris, and at present working with FAO Forestry Mission for Mexico

IN almost all tropical countries uncontrolled forest exploitation ends in the impoverishment of the peoples living in the forest and in the deterioration of the forest itself. By the very nature of its mixed composition, the tropical forest is a relatively poor one and, if cut regardless of silvicultural considerations, it becomes still less valuable, and may no longer be capable of supporting the people who inhabit it.

The utilization of the forest should therefore be carried out with a view to its future improvement and to raising the living standards of the people dependent on it.

The inhabitants of tropical forests subsist for the most part by means of temporary or shifting cultivation, using for the purpose small areas of land cleared of timber and burned, which they abandon after a time and move to new clearings. Such practices can, if uncontrolled, lead to a rapid impoverishment of the soil and to the progressive transformation of wooded lands into savannas entirely unfit for any kind of agricultural crop. When annual fires ravage the savannas, the soil becomes increasingly sterile, land erosion becomes more accentuated, the flow of the rivers becomes torrential and the micro-climate undergoes a change causing damage that may well extend to regions far distant from the place where the trouble originated.

It is imperative, therefore, to stop the depletion of the tropical forest, whether this be due to uncontrolled forest exploitation or to uncontrolled shifting cultivation. If these two evils could be simultaneously brought under control, then the exhaustion of forest resources and the deterioration of the soil — the two most important causes of the impoverishment of the inhabitants — would automatically be eliminated.

It is not enough, however, merely to eliminate the wastage of material resources. Attention must be given to the development of the inhabitants themselves, and they must not be dismissed as simply backward people. The inhabitants of almost all tropical forests — especially those who live by shifting cultivation — are thinly settled, live at a low economic level, and are slaves to their mode of existence ; their lives are very primitive, their health bad, their huts poor, the birth rate low, and education practically non-existent, but any improvement in their mode of living must depend on the progress that can be made in utilizing the natural resources by which they are surrounded.

Although there is still a great deal to be learned about tropical forestry and agriculture, some facts are already well known. Crop rotation, use of fertilizers, cattle raising, irrigation, anti-erosion land cultivation, the growing and tending of forests, fire suppression — all have been successfully practised in many countries. Yet almost everywhere individual attempts to introduce these practices, no matter how praiseworthy, have had little effect in improving the condition of forest communities which were in a low stage of economic development. From this it has often been concluded that such populations are not adaptable to modern life and are incapable of progressing, with the result that efforts to help them have too often been abandoned.

Although forest communities, either because of their low standard of living or because of the sparsity of the population, may not be of great economic importance in the immediate future, they nevertheless deserve honest consideration. Efforts to improve their living conditions are justifiable first as a means of stopping wastage of natural resources — a wastage which can adversely affect more highly developed neighboring communities — and second, because any improvements, no matter how small, can often become the starting point for more solid achievements later on when conditions are favorable.

The ideas presented in this article are based on ten years' practical experience in Cambodia, Indo-China, on problems which affected six villages with a total population of about 1,500 persons, who were at varying stages of development towards a more modern way of life. The lessons learned have since been compared with experience in different countries, which has proved to be similar, and the principles laid down here are not, therefore, theoretical or Utopian, but have a solid factual basis. Long practice has taught that the application of these principles is a matter of the utmost necessity, which, if it were more generally realized, would be the means of avoiding many disappointments and considerable expense.

Need for Close Co-operation between Technicians

When one examines closely the reasons why a community does not adopt the more modern practices that are being pressed upon it, one discovers unexpected diffi-

culties which can be understood only by putting oneself in the position of the people who stand to be benefited.

Here is a typical case with which the author has had to deal and which concerned the possibilities of improving certain lowlands by using a high-yielding variety of rice.

This particular variety of rice required not only irrigated land but fertilization — an agricultural process completely unknown to the local community. To obtain the necessary fertilizer, livestock would have to be raised, fodder provided and the manure collected. In addition, special driers were necessary to bring the rice up to standard, the operation of which required a higher physical condition than was to be found among the indigenous population. The whole project, therefore, depended on the improvement of the diet of the community ; this could be most economically achieved if the rice were husked on the spot (and not, as hitherto, at large milling centers), and the husks used for raising small livestock, particularly pigs, for the benefit of the community. A small local agricultural industry would thereby have been established requiring competent workers to manage it, even perhaps brought in from outside the area, in which case they would have to be provided with housing and sanitary facilities.

The purpose of this example is to show that for any given region where the economy is oriented toward raising one particular product (whether in agriculture or forestry), it is necessary to obtain progress not only in one technical field, even if it is the most important one, but also in all accessory branches of the work. It may be stated as a general rule that solid progress in one branch of a given activity is proportionate to the progress made in all other branches of the same activity. In other words, progress is either total or nil.

Another example from Cambodia may be quoted. A certain region was so swampy that it was scarcely inhabited, so in order to carry out forest work, the Forest Service was obliged to bring in workers from more populated regions. However, to make work in such an unhealthy locality at all possible, it was necessary to launch a systematic campaign against the swamp conditions, a preliminary measure being to inoculate with anti-malarial drugs all workers to be engaged in draining the area. As drainage of the whole region was not necessary but only of the areas to be freed from malaria, groups of people were settled in places where a minimum of drainage was required, leaving enough water for the log ponds for the sawmill, for watering the forest nurseries, and supplying the everyday needs of the inhabitants. The anti-malaria drainage channels were utilized for irrigating rich lowlands, which were then transformed into vegetable plots to provide local-grown food. Reforestation was done in such a way as to cover the drains with dense vegetation that kept out injurious weeds and prevented the breeding of the malaria mosquito. The log ponds near the sawmills were constructed so as to permit the treated water to pass out into the anti-malaria drains and kill any *Anopheles* larvae there. The animal quarters were situated so as to form a protective barrier between the human habitations and the mosquito zone, since mosquitos show a greater preference for cattle than humans. Here then is an example of how a difficult and costly enterprise can be solved through the co-ordination of several techniques — sanitary, agricultural and silvicultural.

Need for Co-ordination in the Field

Co-operation must exist not only between the different technical branches interested in rural economy, but also between the organizations representing private and public interests, administrative authorities, and any other services having local influence. The need for such co-operation seems so logical and elementary that it should not be necessary to emphasize it. In practice, however, technicians frequently become interested in their own activities to the exclusion of the activities of others. A spirit of co-operation must be developed which rises above personalities and specialized activities — co-operation which finds its expression in work in the field. For this purpose a single person should be responsible for directing the combined efforts of all services. The permanence of his position must be assured and he must be assisted by a staff of technicians. His role is to exert a favorable personal influence on the population and to direct all private and public activities towards the combined work of modernization. This is the same principle which has been followed, but on an infinitely larger scale, in the Tennessee Valley Authority ; the same ideas recur in " l'Organisme francais de modernisation du paysannat au Maroc, " and similar organizations in many other countries. This modernization movement need not be a purely public activity : it can be supported and sponsored by private enterprise if private economic interests coincide with modernization plans, or it may be undertaken as part of a contract with the government.

Importance of the Psychological Factor

Often the difficulties encountered in carrying out a modernization plan lie not in the lack of technical knowledge, but in the attitude and reactions of the local inhabitants. The populations of forest regions are often superstitious, unwilling to change their mode of life and suspicious of strangers, especially of foreigners. They often believe that a way of life different from their own and more advantageous conditions of work are the birthright of a privileged class, which has at its disposal wealth, which they themselves can never have, a class which travels at government expense and which associates with people whom they consider as oppressors. An essential, therefore, for creating a better understanding, is that the person who inspires any modernization movement and his collaborators should speak the language of the region ; they must have both the desire and patience to reach an understanding with the local people, and be capable of appreciating the position and reactions of those with whom they have to deal. It must be remembered that if a forest population is recalcitrant and defiant, it is often due to the fact that their only previous contacts with the outside world have been with unscrupulous timber merchants who took advantage of their ignorance, or because they have been subjected to unwise and onerous administrative measures. But once their confidence has been gained, these populations, whose material needs are few, will often undertake work on projects from which they themselves do not derive any immediate

benefits, a result which it is often difficult to achieve even with more highly developed communities.

Applied psychology is now the order of the day, and some countries in recent years have made considerable progress in this direction in connection with rural welfare. In embarking on any rural modernization in the forest regions of the tropics, many unnecessary and costly disappointments could probably be avoided if advantage were taken of the experience gained in the same field in other countries.

Development Sectors

In order that the head of any development enterprise can exert effective influence, experience would suggest that his responsibility should not cover a community of more than 2,000 to 4,000 people. This number may with advantage be reduced still further, depending upon the dispersion and degree of economic development of the population. Even within this size administrative unit any attempt at modernization must be gradual and should at first begin with a single community and the territory closely attached to it. For convenience let us call this unit a "development sector." Any local program of modernization must be integrated with the over-all program, but considerable latitude must be allowed for local adaptations which are proved to be necessary.

In development sectors, continuity of effort, assured financial support, and especially the retention of proven competent personnel, are of fundamental importance. There are many examples of rural development which began well but later failed, either because the particular person who inspired the movement left the area, or because the necessary funds were suspended, or because the responsible authorities abandoned the project at the first difficulty encountered. Financial support must be assured, a point which promoters and even engineers do not always appreciate. A temporary stoppage in the construction of a dam or of a road does not as a rule result in any irreparable material loss, but an interruption in rural progress often strikes a blow from which it is difficult to recover. It may be easier to start all over again than try to repair the damage.

Creation of Pilot Sectors

The final goal of technical assistance is, of course, to bring about modernization not merely on small areas but over vast territories. If it is desired to obtain results for demonstration purposes, these results must be substantial and pay for themselves. Those communities which are to be benefited by modernization, must be in favor of it and be willing to underwrite its cost, even though this be spread over a period of years. To create in a population a state of mind favorable to modernization it is necessary to show them the benefits which can accrue, besides giving them verbal assurances from the heads of development sectors. The most effective demonstration is not provided by the individual experimental station, but by the example of a neighboring village or township which has successfully raised its living conditions and is satisfied with the results. This is especially so if the original conditions of the two communities are comparable and if the people speak the same language. What, however, is needed most is the creation of a pilot sector in each region or in each type of rural economy, a center where the most advanced lessons of accumulated experience can be shown, as well as a practical demonstration of their application. This should not be limited to a single type of experimental station or of technical procedure, but should be typical of the whole community with its inhabitants, the territory upon which they depend, its economic life and its problems. Intensive studies of a fundamental character can be concentrated at the pilot sector, practical tests of different methods of production carried out, pilot enterprises of one kind or another established, and other similar activities. The cost of maintaining such a center is usually fully justified because the experience gained stands to be of the utmost value over a very wide area.

Since the ultimate purpose is for the communities to bring about the necessary improvements by their own efforts, or with the aid of private enterprise, it is essential that the costing of development projects be accurately maintained and kept separate from expenditure on research. Only in this way can the real progress of modernization be tested. The use of a large number of inhabitants as regularly paid objects of research should be avoided. If research and studies are necessary, they should be conducted on pilot sectors and their cost kept separately.

Example is the Best Teacher

In communities which have fully assimilated the ideas of modernization, or which are on a higher plane of economic development, the results achieved in a pilot sector find ready application. Where the lessons learned do not spread beyond the sector, it is advisable to interest private enterprise or various authorities in arranging study tours from neighboring settlements. If this is not enough, then additional sectors must be established of a simpler character but over a wider field. Such additional sectors are best attached to some specific activity — to silvicultural projects in forest regions, for instance. Every forest enterprise, whether it be timber cutting or reforestation, assumes as a part of its work the establishment of settlements, construction of roads, drainage works, etc. These in themselves can serve as practical demonstrations of modernization.

In some countries, the sectors of agricultural modernization are combined for administrative purposes into one central organization forming a separate public service. In Morocco, for instance, it is called "Le Paysannat marocain." It is not necessary to have a separate organization for forest modernization ; the types of economy and the conditions of life of forest populations are very much the same, and the need is rather for a small number of pilot sectors to demonstrate the means by which progress can be attained. The best solution seems to be to leave the control of these sectors to the Forest Service.

The means thus far discussed for raising the standard of living of populations in forest regions are based on

persuasion, education, and on creating conditions appropriate to steady progress. The success of these efforts will depend on the personalities of the heads of the development sectors, on the effectiveness of the methods of propaganda and demonstration, and on technical improvements. The question often arises as to whether these means alone are sufficient and whether the intervention of the local administrative authority can be of some decisive help. For backward peoples, a paternal authority that is kept " well advised " is of great importance. This authority must indeed be well advised, because there is always the risk that any artificial changes imposed upon the mode of life of the inhabitants will disappear as soon as the authority weakens or changes. Nevertheless, imposed decrees are often the only way of stimulating enthusiasm for work in populations somewhat inclined to laziness. A rise in the level of rural life will not be long lived unless it has been " gained " by the efforts of those who ultimately benefit from it. But whatever means are employed — persuasion or authority — the influence of the local authorities already in being, whether they be administrative, religious, or even commercial, should never be undermined. Being on a higher level than the rest of the population, they are often the easiest to convert to ideas of modernization.

It remains true, however, that the best means are always persuasion and rural propaganda. What is needed now is a concerted effort through international co-operation to study new ways of reducing the costs of modernization, of discovering new methods, and of developing means for carrying out field investigations and spreading information, so that each step taken toward progress in this field, no matter by what country, may redound to the benefit of all others.

The following point needs special emphasis. The less a population is developed economically, the greater the need to study methodically and thoroughly the problem of modernization in the particular type of productive enterprises in which the inhabitants must actively participate. In forest regions, solid progress can be achieved only by great concentration of effort in the places where the work is to be done. An examination of the question as a whole will bring out the related problems for which a solution adapted to local conditions must be found. [1]

In the domain of rural welfare, as in all human activities requiring a high degree of perseverance, it is wise to proceed slowly and within the bounds of possibility. The creation of pilot sectors, which allow problems to be studied in their entirety with a backing of adequate funds, must therefore be the first stage in any lasting progress to be achieved by technical assistance.

[1] The same thesis is expanded in the United Nations publication *Formulation and Economic Appraisal of Development Projects*, (see footnote to p. 120)

Pulpwood From Tropical Forests

By Dr. ROBERT W. HESS
The Mengel Company

This paper was delivered at the fifth meeting of the FAO Technical Committee on Wood Chemistry held at Appleton, Wisconsin, U.S.A., September, 1951.

ANY discussion on tropical forests soon brings out the tremendous scope and the interminable ramifications of the subject. If the extent of these forests, their composition, wood volumes, forestry requirements, and utilization are considered, the subject becomes vast. The experience of temperate forestry is inadequate to span the extremes found in all these regions and it is difficult to make a logical generalization from the enormous number of variants. That the forests can be studied and classified into workable forest types is evident by the excellent work done in some regions. The extent of this detailed classification and enumeration is, however, pitifully small in comparison with the needs. The development of forestry practices and adequate utilization studies lag far behind. Fortunately, taxonomic botanists have explored most regions of the earth and have identified most of the important species.

Prospects of obtaining any large amount of additional information in the near future are not promising. It is true that worthwhile projects of significant scope are being carried on in various parts of the world ; the fact remains, however, that for almost any given tract of timber in the less heavily populated regions of the tropics very little information can be found concerning the physical, chemical, or processing properties of the woods, the natural characteristics of the trees, or the silvicultural methods applicable to the type of forest. More forums and publications are needed to bring out available information, and greatly increased facilities for studies of tropical timbers and forests are required to supply basic data.

The dearth of specific information should not deter the utilization of tropical forests. Scattered information points out the trends, fundamental principles are

applicable, and carefully directed *applied* research can yield answers in a comparatively short time.

Available Timber Supplies

While the area of tropical forest land of all types is very large, that which is capable of continued production of wood for pulp is less than half of most published figures. Many forest regions of the tropics support a much higher population than is generally realized. A large proportion of these people practise some form of shifting cultivation which removes the timber and in some areas depletes the soil, thus preventing the re-establishment of good forests for very long periods. A large percentage of the tropical soils are clay, some are coarse sand and in both cases there is a layer which is very high in organic matter on top of the mineral soil. After exposure to sun and heavy rains for one to two years, as with farming, the organic matter is virtually all lost. It is not surprising that recently abandoned agricultural lands frequently support only a poor growth of weed tree species. The amount of such cut-over land and the condition of the re-stocked farms is a matter for conjecture, but the area is huge and the quality of the new forest generally very poor. Thus, the search for forests suitable for the production of pulpwood must take into consideration the timber, soil, and land history.

Coniferous Forests

The coniferous forests of the tropics are relatively small in extent and most are being heavily cut. The pines of Mexico and Central America offer possibilities for pulp and lumber production in certain areas, particularly if a planting program is started at an early date to supplement the acreage of old growth now in existence. In most regions considerable railroad or main automobile road construction will be required before pulpwood can be hauled to a suitable mill site. Large rivers are available at lower levels, but the suitability of their water for pulp production is usually unknown.

No coniferous forests are available in the northern portion of South America. The heavy cutting of the Paraná pine in southern Brazil for lumber and veneer makes use of this species in its natural state for pulp problematical. Mexican pines can probably be grown rapidly in this area, offering a means of establishing a permanent source of supply.

Conifers have been largely cut out in Chile except in remote mountain areas, and plantations would appear to be the only suitable source of large quantities of coniferous pulpwood in most of this region.

The pine forests of the West Indies are of limited extent and heavily cut-over. The same is true of coniferous forests of the Mediterranean region. In South Africa, extensive areas of exotic pines have been planted and have attained saw-log size. The podocarps and red cedar of north-east Africa are of little interest for new pulp exploitation. Conifers exist in the mountains of south-east Asia and on some of the islands of the south-west Pacific ; it is possible that certain areas could be found here which would be suitable for pulp production.

The development of forestry practices for securing a sustained yield in tropical pine forests would not be exceptionally difficult for an experienced forester. Local observations and adaptations of practices in the southern pine areas of the United States would permit a start on a limited basis. Reproduction can probably be obtained satisfactorily wherever there is a fully stocked stand of pine and where intrusive hardwoods are not too plentiful. In areas where hardwoods and pine are mixed, particularly at highest elevations and in the moister areas at lower elevations, it may prove difficult to prevent replacement of conifers by vigorous hardwoods. As in temperate zone forests, it is important to determine the rate of growth and productive capacity of any tropical coniferous forest selected for possible pulpwood production. Not all tropical forests grow rapidly and many have a low volume yield per acre.

One of the most promising future sources of pulpwood from the tropical regions is from pine plantations. The Australians, New Zealanders and South Africans have demonstrated the practicability of obtaining very rapid growth and high volume yields from planted exotic pines, and it is reasonable to assume that similar success can be obtained in Central and South America. Careful analysis of the problem and considerable research should precede any large development, but there is every reason to believe that it can be accomplished in a comparatively short period of time. Examination of planted individual trees and any small plantations in the region will yield much information if soil conditions, elevation, rainfall and other factors are taken into consideration. Studies of natural reproduction in the locality may yield vital data. Provisions for detection and control of disease and insect epidemics should be an integral part of such a program. While sufficient information exists to permit a reasonably sound selection of species, good management requires a continuing study of better species and strains for increased yields. Location of suitable soil types may prove difficult, especially in areas where farming is extensive. It is assumed that no attempt would be made to establish pines in climatic conditions not known to be suitable for their growth and development.

A reasonable solution to the time factor involved in the production of pulpwood with plantations of tropical conifers would be to obtain a tract of timber sufficiently large to supply the required volume of pulpwood and to pay for planting costs until the plantations begin to produce. Complications will obviously arise in the future as the reproduction of cut-over land and the planted stock of the same age classes reach maturity. It should be possible to overcome this maladjustment of the first cutting cycle by varying the growth of natural as compared with planted stock, the age and size at time of cutting, the use of thinnings while growing a stand of saw-log timber on part of the area, the purchase of pulpwood during part of the period, and similar methods. Careful adherence to well made long-range plans would be required.

In optimum areas rapid rates of growth may be expected and volume yields of pulpwood may be expected in twelve years, although this may not be the age at which the greatest volume yield per acre is obtained.

Hardwood Forests

The great bulk of the forests in tropical regions consists of hardwoods in varying degrees of mixture. Along the coast a riparian type, often predominately mangrove, is commonly found, usually forming a narrow band adjacent to, and partly in, the salt water. Immediately behind this in deep swamps and along the large rivers often lie more or less similar swamp types, characteristically one or more species with stilt roots, and others with abnormal (sometimes grotesque) developments of root flanges.

These vast areas of mangrove, black mangrove, and swamp forests are a challenge. In addition to the large volume of wood and the comparatively few species involved is the interesting high tannin content of the bark of some species. Reproduction from seed and sprouts will probably be excellent, at least for the second generation. If the wood can be processed to advantage there remains the development of an efficient, presumably water-borne, means of harvesting the trees from their interlocked stilt-like or high flanged stumps. The adaptation of a barge as a combined skidder and loader, using a cable haul from a spar tree, should permit low logging and hauling costs. Stumpage costs or fees should be extremely low for this at present almost worthless timber.

Above and inland from the swamp forests lie the great tropical evergreen hardwood forests. [1] These range from periodically inundated lands along the rivers to pockets high on the mountain slopes, and even to forests in the nearly perpetual cloud cover of mountain tops. The forests are evergreen, although some of the trees may lose their leaves periodically. This is the forest that covers enormous areas of eastern Central America, northern South America, the Amazon Valley, West Africa, the Congo River basin, Malaya, Borneo and the Philippines. It is primarily the extreme heterogeneity of this type of forest that has so far prevented extensive exploitation of its many valuable timbers.

Contrary to the usual conception, within reasonably restricted regions the number of forest types in the tropical evergreen forest is not excessive. In fact, over hundreds of square miles it may be possible to classify the forests into a dozen major types; a given area of the eastern United States might have as many. Here, however, enters a complicating factor.

The occasional or rare species in the majority of the tropical rain forest types make up a significant percentage of the total. There are not only a great many of these rare species, but they also occur with varying frequency in different parts of the same or similar type of forest. Thus, it is the usual practice to consider the frequency and value of only the predominant species, except for a few rare kinds which are particularly valuable (e.g. mahogany and rosewood). This procedure appreciably lowers the usable volume per acre.

There seems to be little chance of successful pulpwood operation in the more heterogeneous types of tropical evergreen forests. Until a universal pulping process is developed, which will utilize all kinds of wood, the possibility of harvesting sufficient volume per acre appears remote. The most practicable operation in forests of this type would appear to require complete removal of the existing forest stand and replacement with one or two planted species. The traditional practice of shifting cultivation is being used to a limited extent to obtain such clearing and planting. As most of this farming is of one to two years' duration, the rate of timber removal is significant in populated regions.

An additional detriment in the use of the mixed tropical hardwood forest for pulp production is the forestry aspect for continued reproduction. In most of the forests there are one or two tiers of smaller trees below the dominants. Even in forests which are composed predominantly of a single species there are scattered individuals (often large) of other species. The second generation is, therefore, often difficult to determine and commonly impossible to control advantageously.

One solution to the exploitation of mixed evergreen forests is multiple usage. With a wide variety of wood properties represented among the species, the manufacture of a variety of products would make most efficient use of the forest. It is not unreasonable to assume that a mixed tropical hardwood forest could be cut for pulpwood, lumber, veneer logs, piling, and railroad ties. Such a combined operation would distribute the costs of transportation facilities and reduce the logging costs inherent in forests with a comparatively low volume per acre. Unfortunately, most companies are not interested in such a diversified enterprise and few are capable of finding profitable uses for a large number of tropical hardwoods.

There are certain natural forest types within the tropical evergreen forests in which a single species constitutes a major part of the wood volume. A few of these offer interesting possibilities for pulp production. The woods of some have been tested in the past — generally with discouraging results. Despite this, anyone interested in the exploitation of tropical hardwood for pulp would be well advised to attempt to overcome the pulping deficiencies of species which are locally very abundant, rather than to search for comparatively rare species with good pulping possibilities.

Considerable areas of new land are formed on bars and deltas in some large tropical rivers. The trees which spring up on these have been suggested as a source of pulpwood, although it is not definitely known whether there is sufficient volume and whether the woods are suitable for pulp.

In most moist tropical regions, cleared land that is abandoned or neglected is quickly covered by a heavy growth of trees, brush, and vines in varying proportions. Most of these plants grow very rapidly but, with a few exceptions, do not generally attain any great size. The rapidity of growth and ability to grow well in the open suggests that these areas might be subjected to clear cutting for pulpwood. Unfortunately, there is usually a mixture of species varying widely in wood properties. A number of the woods are light and soft, indicating a low unit volume yield, and often short fibers, even if their properties are satisfactory. More-

[1] The term is used loosely here to apply both to rain forests and to moist evergreen forests. Moist and dry deciduous forests are not considered.

over, there is the problem of losing the tract to, or expensively combatting, the adventitious vines that choke all growth in many areas, particularly those with poor soil or which have suffered repeated clearing or burning. In few areas will it prove practicable to manage or harvest for pulp the natural growth that follows agriculture or other clearcutting operations.

Although not all of the variants and possibilities have been considered here, it is evident that only a limited number of the evergreen tropical hardwood forest types are at all suitable for the production of paper pulp by methods in use today. Where large volumes of one or more species having suitable technical properties occur over a limited area, the natural forest may be used to produce pulpwood, at least for one crop. The alternative is the establishment of plantations of one or more hardwood species. These will presumably be rapidly growing types, such as those which characteristically encroach on abandoned land. On fairly good soil with selected species, it is not unreasonable to expect an average diameter growth of one inch per year and the theoretical productivity per acre will be very high. Poor soil or unsuitable moisture conditions will drastically reduce the rate of growth in the tropics, as elsewhere.

When the species has been selected the operator will probably be faced with the problem of establishing a nursery, raising seedling stock, and conducting planting and cultural operations with little, if any, information or experience to guide him. Control of diseases, insects, and competitive plants will be problems of the moment; fortunately, recently developed chemicals give material aid in this phase of the work. Also, the extremely rapid growth will permit early observations and, therefore, a more rapid accumulation of experience. There appear to be great possibilities in the production of cellulose or pulp with rapid-growing planted tropical hardwoods, and among the hundreds of promising species that have not been tested are probably several excellent producers.

One important factor will be the labor involved in clearing areas or lines for planting and for the protection of planted stock during the first two years. Probably similar cultural work will be advisable to assure survival and to stimulate the growth of seedlings in naturally reproduced forests. While this type of labor is not costly in tropical regions, the size of the areas to be dealt with, and the frequency of clearing required, makes the operation one of the highest per acre costs associated with the growing of planted tropical hardwoods. Sprays or other applications of chemicals may prove economical methods of controlling invading vegetation in certain instances, but often these will be more costly than manual operations with the machete.

There is a practicable approach to the utilization of an existing tropical hardwood forest for pulp and for obtaining successive cuttings from the same area. As the initial cutting proceeds, the entire area is cleared of vegetation: it should then be thoroughly burned. Perhaps some of this clearing and burning operation can be carried out without direct charge by permitting villagers to grow one crop of maize on the cut-over land. (This practice would deplete already poor soil and might seriously shorten the life of the operation. Following clearing, seedling stock would be planted and protected for two years. Such an operation would probably require the establishment of a nursery prior to cutting. A period of research into nursery and planting practices might be necessary to ensure success. The species would then have to be selected for planting and seeds or "cutting slips" obtained a year before beginning harvesting the pulpwood. However, if carefully planned and organized, an operation combining the cutting of old growth timber and complete replanting should prove successful in tropical hardwood regions.

Bamboo and Palms

The use of bamboo as a source of pulpwood has many advocates. Among its advantages is the continuing production of stems for harvest, eliminating the need for replanting. One serious difficulty is that of obtaining sufficient plants to start operating on a large scale. A further obstacle is the five-year period which must elapse before the first cutting. The large gross volume of stems per unit weight or volume of cellulose may add to production costs. In spite of these deterrents, bamboo must always be considered in any proposed program for the production of pulpwood in tropical regions.

Hundreds of species of palms occur, often abundantly, in the tropics. Some kinds grow rapidly, often in close stands; in isolation they may reach large dimensions. Their woods vary from soft and spongy to extremely hard and heavy, sometimes with a density greater than that of water. Characteristically, the logs have a soft inner core and a harder outer shell. The wood is composed of long, very hard strands of fibers imbedded in a tissue of short parenchymatous cells. It is the abundance and spacing of these strands that causes most of the density variation in the log and among the species of palm. In lower density wood, the amount of long-fibered material obtained would constitute only a small percentage of the total volume of material. Certain species of palms could presumably be grown for their wood just as some are now grown for oil, dates, and coconuts.

Deterioration of Pulpwood

In tropical regions, and particularly during rainy periods, the rate of sapwood deterioration from stain, decay, and insects is extraordinarily high. Water storage might be a partial answer, although brackish water must be avoided. Water spraying is probably not sufficiently effective. Certain chemical sprays or dips will control the insects and reduce stain if they are not too expensive for this application. The best solution would seem to be utilization very soon after cutting.

Seasonal Consideration

Throughout the tropics there is a general belief that logging cannot be done during the rainy season. The extremely heavy rainfall, lack of all-weather roads,

and the soft character of some soil types makes the wet season a formidable obstacle. However, with recent improvements in transportation facilities and equipment, more and more operations are working throughout the year. Better roads, improved bridges, good drainage, clearing of rights-of-way to admit sunlight, etc. are required for road haul. Light rail equipment is economical under certain conditions. Cable skidding should be used to a greater extent. Tractors are frequently used, but full advantage is not made of the attached winch for bunching preparatory to skidding. Vehicles with extra large tires can probably be used in some instances for pulpwood of relatively small diameter. In general, logging during the wet season requires preliminary preparation, the use of special equipment, and ingenuity. Few tropical hardwood forests will be as difficult to log during the rainy season as were the tupelo swamps of the southern United States.

Location of Pulp Mills

There are many factors in favor of locating the pulp mill near the timber, in the tropics. Reduction of volume and weight in shippings is obvious ; deterioration of pulpwood will be reduced and costly chemical dips or sprays will be at least partly eliminated ; closer scheduling of woods operations is possible ; labor costs are lower ; tax rates are very favorable. Moreover, a better local political situation is established, which is a very important factor. (In most countries, there is a strong feeling against the export of raw material without at least preliminary manufacture in the country of origin. This feeling and the attendant pressures are increasing). In all but a few countries, foreign investments in manufacturing enterprises are encouraged and protected, and, if it is possible to include one or more carefully selected residents of the country as stockholders or sub-contractors, the position of the company can be very strong.

Weighing against the establishment of a pulpmill in tropical regions are equally imposing deterrents. There is always the reluctance to make larger than necessary investments in a foreign country. Lack of familiarity with the language and customs of the people is a real obstacle. Technical men and supervisors require salary and other compensations for working in tropical countries. (Lower living costs and tax advantages partially offset this. Rapid air transport at reasonable rates has further reduced the objections). There is insufficient knowledge of the properties of the woods, the processing methods best adapted to each species, the life habits of the trees and the best methods of forest management. Fear of political upheaval or entanglement resulting in unreasonable costs, or even expropriation, is undoubtedly the single factor which is most retarding the development of tropical resources.

A logical sequence for the development of a source of tropical pulpwood might be as follows : first, the study of various locations, forests, and land types and the selection of one. Second, the obtaining of a concession, contracting for the timber or purchase of the area. Simultaneously arrangements for taxes and liabilities should be agreed upon with the government — additional stated benefits to accrue when a pulp mill is established. Third, if planting is involved, a nursery should be started and experiments conducted. A properly balanced area will permit five years of nursery development before the first plantings are made. Fourth, installation of equipment, transportation facilities, etc. Fifth, commencement of operations. Initially, the pulpwood would be sent to an established mill, and eventually, if everything went well, a mill would be built near the wood source.

The economic and technical problems of tropical wood utilization are great, but not insurmountable. The manufacture of pulp from these sources is entirely practicable if careful and comprehensive planning, technical control, and judicious diplomacy are practised.

International Union of Forest Research Organizations

The Joint Bibliography Committee of the International Union of Forest Research Organizations and the Food and Agriculture Organization of the United Nations met at Wageningen, Netherlands, from 30 August to 4 September, 1951, for its fourth session. Prof. E. Saari of Helsinki, Finland, presided.

The Committee reviewed the progress on the adoption of the Oxford System proposed for classification of forestry literature, now officially adopted by FAO and the Union for this purpose. The Committee also considered at length the organization of international documentation in forestry, analyzing the current work of existing centers, the gaps which still exist in such services and the possible methods of remedying them. Its recommendations will be presented to the pertinent organizations for action.

Afterwards the Permanent Committee of the International Union of Forest Research Organizations met from 4-8 September. Seven members were in attendance plus an equal number of the leaders of technical research sections. Professor H. Burger presided. The Committee reviewed the general activities of the Union and the progress made by various research sections in facilitating contact between technical workers and in formulating research problems of international importance. The Committee also made tentative plans for its next Congress, proposed for Rome in 1953.

Loblolly Pine

Maintaining this Species as a Subclimax in the South-eastern United States

By THOMAS LOTTI and R. D. Mc CULLEY.

South-eastern Forest Experiment Station, U. S. Forest Service

IF there is one basic problem confronting silviculturists the world over, it is the maintenance of a forest cover that will produce the maximum in human benefits consistent with the ecological limitations of the site. Where the natural successional climax is also the best forest cover for man's economic use, there is no conflict. But in many places a subclimax forest is preferred by the timber manager because its components grow faster or have greater commercial utility than the climax species. Where this is true, the silviculturist must know how far he can compromise with ecological laws in indefinite maintenance of the subclimax. Then he must develop the techniques for maintaining the subclimax in the face of ecological trends.

If one were to select the particular ecological trend which has given foresters most concern, it would probably be the natural replacement of pine by more intolerant hardwoods. On the best hardwood sites it is usually uneconomical to fight this trend, for the yield of hardwoods is high in quantity and quality, and they are often very difficult to replace. The major problem arises on sites of medium or lower productivity, where pines tend to be joined or replaced by hardwoods having smaller yield of less valuable timber. In the United States, this trend has been accelerated over extensive areas by selective removal of the pines without provision for their regeneration.

The problem is particularly pressing in the loblolly pine type (*Pinus taeda L.*) of the south-eastern United States. From a point on the Atlantic coast just east of Washington, D. C., the loblolly belt swings south-east in a broadening crescent for a distance of nearly 1,500 miles (2,414 Km.), crossing the Mississippi River and extending into the states of Arkansas and Texas. At the northern end of its range this species is confined to to the flat Coastal Plain. Farther south, longleaf (*P. palustris*) and slash pine (*P. caribeae*) take over the Coastal Plain, and loblolly pine grows primarily on the rolling lands of the interior.

So extensive is this great belt that it conveys the mistaken impression that it is a natural climax forest. On the contrary, it is only a subclimax, which in a state of nature, would be succeeded by hardwoods such as maple, beech, and certain oaks and hickories.

In a large part of this domain, such as the rolling uplands of Georgia, Carolina and the Virginia Piedmont, the forest once almost attained this climax. Here early travelers encountered extensive stands of hardwood. These soon fell to the settlers' axe and were succeeded almost totally by plantings of corn and cotton. This led to serious soil erosion followed by large-scale land abandonment. In these abandoned fields, the exposed mineral soil furnished ideal conditions for rapid natural regeneration by adjacent scattered pines, and the result was a forest largely comprised of pine.

On the sandy Coastal Plain, the first settlers found a forest already predominantly pine. But, since hardwoods were also present, the dominance of pine cannot easily be explained. Perhaps the hurricane winds, as well as tremendous fires started by the Indians or by lightning, produced conditions leading to the establishment of large areas of pine. In any event, burning and clearing for agriculture by the early settlers helped to perpetuate and extend the subclimax loblolly pine. These practices prevailed for more than two centuries.

During this time, a great pine industry was gradually built on the utilization of this subclimax type. In the fifty years from 1900 to 1949, the harvest of southern pine for lumber has averaged 10,000 million board feet (27.2 million m^3) a year, and made up two-fifths of the total softwood lumber production of the United States. Of the southern pines, loblolly is by far the leading source of supply. In 1945, over half the volume of softwood saw-timber in 13 southern states consisted of loblolly pine.

Now a great change is again taking place in this pine region. The effect of human activity on the loblolly subclimax, upon which south-eastern industry depends for its supplies, has been to reverse the previous trend. The strong natural trend toward hardwoods is accelerating at an alarming rate. In the past 12 to 14 years, hardwood areas have doubled in Mississippi, and increased 35 percent in Arkansas. In coastal Virginia, low-grade hardwoods occupy one-fifth of a two million-acre pine site, and in South Carolina, the hardwood types cover a 59 percent larger area than they did 10 years ago.

One reason for the swing of this centuries-long pendulum is that agriculture is becoming more stable, and less land is reverting to forest. Another factor is the logger's preference for pine ; each cutting leaves more hardwoods behind to occupy the site. Another important reason is that organized protection is eliminating widespread uncontrolled fires, thus enabling dense hardwood understories to develop in the pine stands. Harvesting of mature loblolly accelerates the growth of this hardwood understory, and the establishment or survival of loblolly seedlings is often prevented by

A typical stand of Mature Loblolly pine (Pinus taeda L.) in the Atlantic Coastal Plain area.

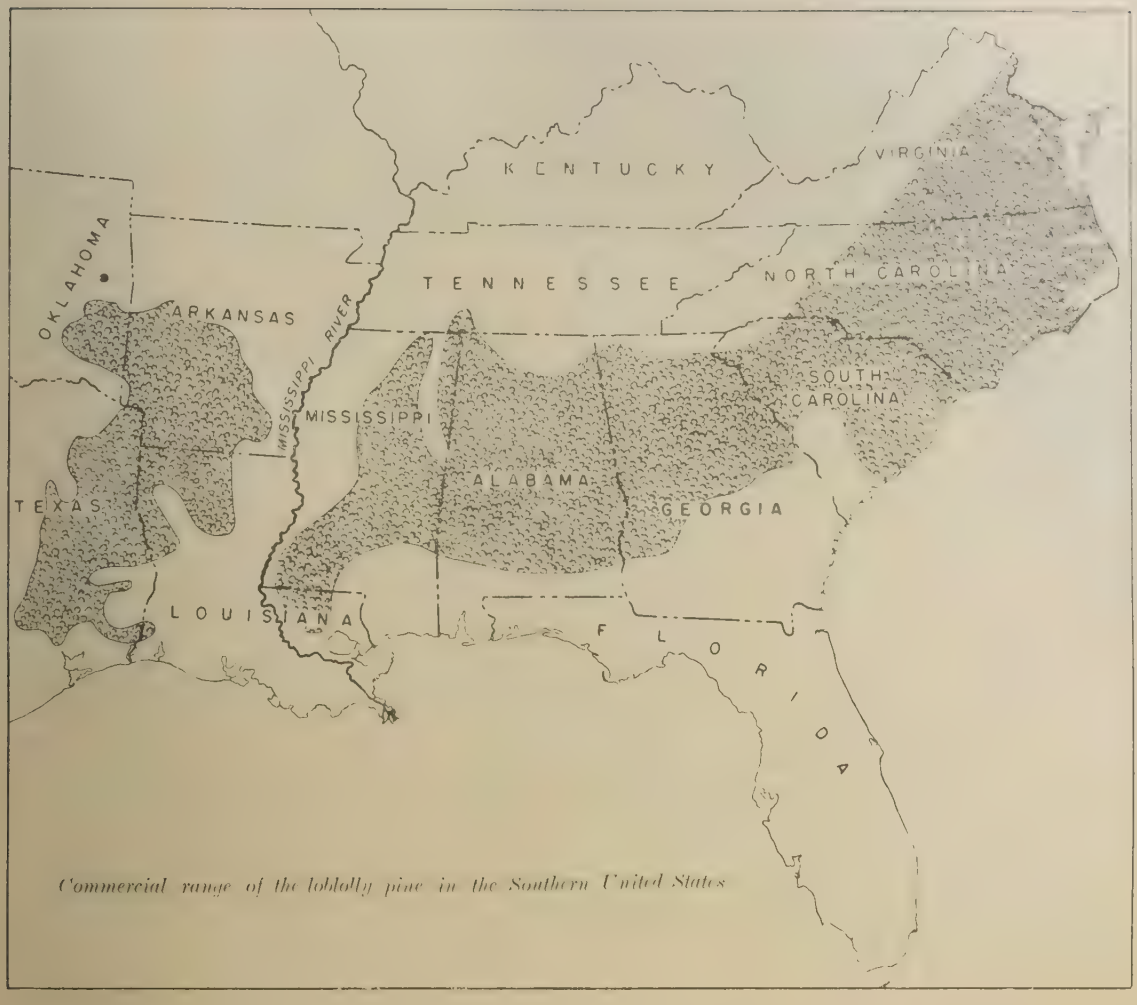
aggressive hardwood stems. Thus, thousands of acres, bought and held primarily for pine production, have become converted to hardwoods.

It is now clear that over large portions of the southeastern United States, pine stands can be perpetuated only by reversing the present trend toward hardwoods. Foresters in this region must first decide how far they should go in maintaining the pine subclimax on different sites. With the permanent hardwood types in the better bottomlands there is no particular problem because hardwood management is profitable, and conversion to pine very expensive. The problem centers on the majority of the remaining sites, which are clearly capable of yielding higher returns from pine than from hardwood. These sites vary from badly eroded clay hills of the Piedmont, where a hardwood component may be needed to rebuild the soil, to flat sandy soils of the Coastal Plain where successive generations of pine apparently have no adverse effect. Intensive forest management is centered for the most part on the latter area. This paper concerns primarily the techniques that have been developed for maintaining the pine subclimax in the Coastal Plain of Virginia, North Carolina, and South Carolina.

The fight against conversion to hardwoods is usually won or lost during the regeneration stage. Research on the problem has followed two major lines: first, the study of the regeneration habits of loblolly pine so as to allow prompt and adequate pine reproduction in the face of hardwood competition; and second, the study of methods for controlling the hardwoods sufficiently to allow pine regeneration to win through.

Regeneration of Loblolly Pine

The South-eastern Forest Experiment Station is now assembling the basic facts about the regeneration of loblolly pine. Information has been collected on seed production, seed dispersal, and seedbed requirements, and research in this field is directed towards obtaining pine reproduction at or before harvest time, since hardwood sprouts will often fill the openings within one year.



Commercial range of the loblolly pine in the Southern United States

Seed Studies

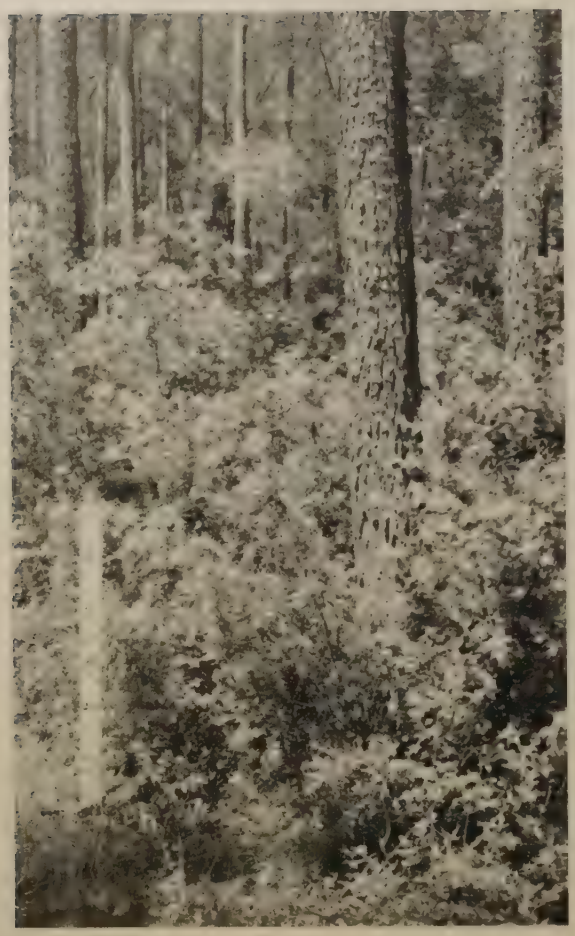
Seed trap studies show a tremendous annual variation in loblolly pine seed production. The same average mature loblolly seed trees, which in a good year have produced between 9 and 15 thousand sound seed, will in a poor year produce less than 600 sound seed. On a fairly uniform level over a large part of the range of loblolly pine, a heavy crop occurs at irregular intervals of from one to five years. Records for one stand showed that about 50 percent of the seeds were empty when a total of 200,000 per acre (81,000 per hectare) were produced, but that only 25 percent were empty when the stand produced a crop of 500,000 seeds per acre (202,000 per hectare). Also, it was found that seed loss caused by insects is proportionately much heavier in a poor year than in a good one.

Predicting Good Seed Years

The next step was to find ways of predicting good seed years far enough in advance to enable foresters to take advantage of abundant seed in planning timber harvests. Means of predicting the size of the next seed crop several months in advance of seedfall have been tested in a number of coniferous types. In the case of the loblolly pine a method of cone "rations" has proven quite dependable for a six months' forecast; the forecast is made by counting cones on a three-foot section taken from the tops of cone-bearing trees. There are three sets of cones on each tree: old empty cones that have shed seed the previous year, green cones that will produce the current crop, and small, immature conelets that will not ripen till the following year. A cone ratio for the current crop is obtained by dividing the number that will ripen this autumn by the number that shed seed the previous year. The ratio indicates the relative sizes of the two crops. This technique used 12 months in advance of seedfall has proved reliable in limited tests, but forecasts for a longer period are unreliable because many immature conelets do not complete their development.

Stimulating Seed Trees

When young stands 35 or 40 years old are harvested for pulpwood, there usually is not enough seed avail-



Understory hardwoods in loblolly pine stands in the Coastal Plain are a constant threat to continued production of pine. Some idea of the density of the hardwood understory can be had from this photograph of a typical stand.

able for regeneration. One remedy may be to stimulate seed production by injury, fertilization, or release cutting. Injuries of various kinds have been the least effective means of treatment; fertilization is effective but very expensive because of the large quantities of fertilizer required; release cutting appears to be of the most immediate practical use because no expense is involved and no other treatment tested to date has produced greater stimulation. It has not yet been put into operation on a commercial scale, but it can probably be applied most conveniently as a partial cut three full growing seasons before a stand is to be reproduced. Trees threatening to crowd out potential seed trees are felled to allow their crowns ample room in which to develop. Such seed trees released in this manner on experimental plots produced seven times as many cones as paired unreleased trees. Saleable wood products can be produced in large enough amounts to make this cutting profitable.

Dispersal of Seed

Dispersal of loblolly pine seed is effective under usual conditions to only about twice the height of the seed trees. Cleared strips 200 feet (61 meters) wide in mature timber have been reproduced promptly when about 100,000 seeds per acre (40,000 per hectare) ripened the first year after cutting. Wider strips may seed in satisfactorily when the seed supply is somewhat greater. Volume of seed rather than the distance between trees will dictate requirements for scattered seed trees. In managed forests four to eight seed trees per acre (7 to 13 per hectare) are commonly left in clear-cutting operations, but experience and research are still too limited to permit recommendations for a specific set of conditions.

Selecting Seed Trees

Possibilities for abundant seedfall in the first season following the reproduction cut are increased by a careful selection of the trees to be left. Those 12 inches (30 cm.) in diameter, or larger, with a large number of old cones in the crown have been found to be most prolific. Other characteristics, such as total height, crown development, and the ratio of crown length to total height, have not provided a consistent clue to future yield of seed, although they should be considered in the selection of parent stock.

If natural seeding alone must be depended on to regenerate loblolly pine, the seed supply will often be inadequate, regardless of the number of seed trees left or of the care exercised in their selection. We estimate roughly that, on a favorable seedbed, from 20 to 37 thousand seeds per acre (33 to 61 thousand per hectare) must be produced in the first year to ensure adequate stocking. In a poor year a full stand of mature timber may not produce this amount of seed. At such a time, proper selection of seed trees will be an ineffective aid to reproduction, and cutting may as well be deferred to a more favorable time.

Seedbed Preparation

It is widely recognized that exposed mineral soil is a favorable seedbed for pine. Research at one of our experimental forests has shown that, on the average, 83 seeds are needed to produce one seedling on a surface covered by slash, 29 seeds per seedling on undisturbed litter, 12 seeds per seedling on a burned surface, and only seven seeds to establish a seedling on mineral soil.

Preparation of the seedbed by exposure of mineral soil can be accomplished in a number of ways. Logging itself may be quite effective. Where mature stands had been removed with tractors, several logging units were found to have half the area scarified satisfactorily. Fire can be used either before or after the stand is cut to provide a good seedbed. Mechanical scarification with a crawler tractor and heavy disk or with bulldozers has also proved satisfactory. All of these treatments reduce hardwood competition as well as prepare the seedbed, and some of them are more fully discussed in this respect in the following section.

Two methods of reducing competition from hardwoods are seen here. On the left, a crawler tractor with disk attachment is used successfully to break down the young growth and also prepare a good seedbed. On the right, application of 1 percent 2,4,5-T emulsion in "frills" has considerable promise for large-scale use in hardwood control.

Hardwood Control

Hardwood control on pine sites offers outstanding opportunities for applying modern technology in reversing an ecological trend. The premise for hardwood control on the upland soils of the Coastal Plain is that the hardwoods here are low in quantity and quality of timber yield, but will supersede the more valuable loblolly pine in the absence of cultural measures. Opportunities for influencing the succession by utilizing the hardwoods more intensively than the pine are extremely limited at present. For example, the volume of cull hardwoods alone in the South is sufficient to support the pulp and paper industry of the entire country at the 1947 rate for 15 years, if all pulp could be manufactured from hardwoods.

Control of hardwoods does not imply their complete elimination from the stands. Valuable species, such as yellow poplar, sweet gum, and white oak, are often retained as minor components of the pine stands where the soil is fertile enough for good growth of these species. The real object of hardwood control is to keep the height and stand density of inferior or off-site species down to a level where pine establishment and survival is not hampered.

The most critical control problem in the South-east is the removal of large hardwoods, or the reduction of understories and sprouts of hardwoods, at the time of regeneration of the pine. A second problem is that of keeping hardwood understories in check during the rotation so that they can be dealt with economically during the next regeneration period. The methods developed in the South-east for meeting these problems may have wide applicability to other areas where not only hardwoods but brush and scrub of various types may have to be controlled. The techniques being developed in the South-east include the use of fire, chemicals, and mechanical equipment of various types.

Prescribed Burning

Prescribed fire, which is used in the longleaf-slash pine region mainly to reduce hazardous accumulations of fuel, is now being extended to the loblolly pine region for the control of hardwoods and for other purposes. To keep the hardwoods in check under pine stands, the first fire can be prescribed when the pines are 10 to 20 years old, or when the crowns are high enough to be safe from scorching. Both backfires and headfires have been used. In either case burning, which is only done for a definite purpose, is carried out in accordance with a prepared plan, and under predetermined weather conditions. It is usually done in the winter when the cured vegetation and weather conditions provide a fairly long burning season.

A winter fire is effective in killing hardwoods up to about one inch in diameter. The treatment should be repeated at intervals of four to ten years to keep the hardwoods small enough for continued control by fire. The cost may range from 25 to 50 cents per acre (41 to 82 cents per hectare). Winter fires do not burn deeply into the litter; consequently, they probably

have little or no effect on the soil, particularly in the Coastal Plain. Pine still predominates and general site quality is high even after centuries of repeated fires and at least several generations of pine.

Summer fires may be needed to kill hardwoods that are too large to be killed by winter fires. High rainfall limits the number of good burning days in the summer. When summer fires do burn, they are often hot enough to kill large hardwoods, but great skill is required to avoid excessive damage to young pine stands.

At the time of regeneration, the pine seedbed can be prepared and the hardwoods checked simultaneously by a "pre-seedfall burn." Here the high overstory and the long interval between fires of this type minimize the possibility of damage to timber and soil alike. The most favorable season for treatment is in September and October, just prior to seedfall and in anticipation of a removal cut during the winter after the seed is down. Should fuel or weather conditions not permit burning in these two months there is the alternative of burning wherever possible during the period mid-July to mid-December with the likelihood of less satisfactory results. Another alternative is to adhere to the September-October schedule, but to begin treatment about three years before the harvest cut. This variation is still in the experimental stage but holds considerable promise. If the burn is unsuccessful or is not followed by adequate reproduction the first year, it can still be tried again in two succeeding years, with the advantage of seedfall from the entire stand instead of from scattered seed trees.

Chemical Treatments

Much of our research in hardwood control has been with chemical silvicides. The most promising of these up to now are 2,4-D (2,4- Dichlorophenoxyacetic acid), 2, 4, 5 - T (2, 4, 5, - Trichlorophenoxyacetic acid), and ammonium sulfamate (which is most commonly called by the trade name "Ammate"). In addition to being effective silvicides, these chemicals are non-poisonous to man and animals, a quality lacking in sodium arsenite, which otherwise is a good tree killer. There are three basic ways of applying these chemicals: to foliage, to cut surfaces, or to bark, although there are many possible variations.

Our current recommendation for a foliage spray is 0.25 percent emulsion of 2,4,5-T ester (acid equivalent by weight). Some of the oaks will resprout, but control in other species is very good except for early spring applications. The usual procedure involves a winter fire followed by spraying the sprout foliage during the subsequent growing season. The cost of this treatment is fairly high, ranging from about $ 7.50 to $ 10 or more per acre ($ 18.75 to $ 25 per hectare). Mostly on account of this high cost, the technique does not yet have wide acceptance as a silvicultural tool. Prospects may change with decreased costs brought about by future reductions in the price of 2,4,5-T, but for the present at least, the best of this technique appears to be in the control of woody plants along rights-of-way.

The best results in the use of Ammate are obtained with cut surface application of the chemical, as shown by the work of the Southern Forest Experiment Station. One of the methods used there involves the application of about 3/4 ounce of the chemical in crystalline form to notches or cups chopped into the base of the tree. The number of notches required is determined by dividing the tree's diameter by 2. A second method requires an aqueous solution of Ammate, 2 to 4 pounds per gallon of water (0.2 to 0.5 kg. per liter). This is poured into a frill or single-hack girdle chopped into the tree at a convenient height. The first treatment yields the best results but costs more — about three cents per 10-inch (25 cm.) tree. There is usually more basal sprouting when the second method is used, but the chemical costs only one to two cents per 10-inch tree, depending on the concentration. Both methods have attained considerable popularity, especially as an alternative to axe girdling where the objective is the release of young pine from larger over-topping hardwoods.

For this same purpose the use of 1 percent 2,4,5-T emulsion holds considerable promise as a substitute for the Ammate solution in frills. The emulsion costs only 1/2 to 1 cent for chemicals per 10-inch tree, and, unlike Ammate, has no corrosive action. The results are slower than those of Ammate but there seems to be a more complete kill.

On some of our sites the small hardwoods are so aggressive that two or more weedings are necessary before the pine is free to grow. Therefore a method that will do the job in one weeding is more desirable. We have found that 3 percent 2,4,5-T in fuel oil or kerosene, when sprayed on the tops and sides of recently cut hardwood stumps, will practically eliminate any respouting. The total cost of this control is less than that of two conventional weedings.

The technique of control by bark or basal sprays promises to be a cheap but good method. Research is still in progress but we have weeded small hardwoods from pine at about the same cost as cutting only. Indications are that good results can be obtained from 2 or 3 percent 2,4,5-T in fuel oil, sprayed on the bark in a 2-foot (0.6 meter) band around the base of the tree, but the killing action is slow and some hardwoods may not die before the second growing season.

Use of Mechanical Equipment

In the past few years, the rapid development of heavy forest equipment has opened up new horizons in the control of hardwoods by means of bulldozers, tractors, disk plows, and brush-cutting rollers. Their best use is in mature stands just before or after logging, for the combined purpose of hardwood control and seedbed scarification. Another use is in the reconversion to pine of lands recently invaded by hardwoods.

Bulldozers of 80 to 160 h.p. are used by one industrial organization on lands that have failed to regenerate to loblolly pine. Under average conditions the bulldozer blade is raised just high enough to clear the ground. Two large stumps are dragged behind the tractor, and as the equipment lumbers along covering 1/3 to 3/4 acres (0.2 to 0.3 ha.) per hour, brush, shrubs, and trees up to five or six inches (12.7 or 15.2 cm.) d.b.h. are uprooted and left where they fall. This procedure exposes mineral soil over much of the ground. In dense stands of hardwoods the stump drag is disconnected and the operation becomes one of hand-clearing. In this case the debris is left in windrows about 100 feet (30.5 meters) apart, or pushed into depressions

that are not good pine sites. After salvaging saleable trees and crediting this amount to the operation, the net cost is estimated at less than $ 10 per acre ($ 16 per hectare).

Establishment of loblolly pine seedlings on soil surfaces, churned up by heavy equipment during logging in wet weather, is greatly inferior to that on ground that has been disturbed less severely. The subsequent height of growth of seedlings in these "puddled" areas, at least for the first two years, is less than half that of seedlings on other surfaces. It was feared that the same result might occur on land cleared by bulldozer, but this has not been the case. Growth of seedlings on areas treated three years ago has been excellent. However, a much longer period of observation will be required before the full effect of this practice upon the site can be evaluated.

Another organization has used a multiple-disk plow with stump drag attached to treat areas immediately before harvest cutting. This disturbance, plus that normally associated with tractor skidding, exposes mineral soil on nearly all the ground surface not covered by slash pines. Progress varies from 1 to 1¼ acres (0.4 to 0.5 ha.) per tractor hour.

A third company experimentally used two tree tops dragged behind a tractor on areas previously logged. Satisfactory scarification was accomplished at the rate of 0.63 acres (0.25 ha.) per tractor hour. A more thorough job of scarification has been done by substituting for the tree tops a heavy farm disk plow pulled by a 26 h.p. tractor. Several types of very heavy rollers with brush-cutting knives have also been used in the South to reduce heavy stands of small hardwoods.

Future Outlook

Where do we stand in maintaining loblolly pine as a subclimax type? The techniques described here are largely the result of recent research and have not yet been widely applied. The next forest inventory will probably show some additional shift from pine to hardwood types. However, the area under forest management is steadily increasing, particularly through the land acquisition and forestry activities of large pulpwood and lumber companies in the Coastal Plain. The growing scarcity of pine land available for purchase, combined with the increasing value of timber in relation to other commodities, provides a direct stimulus to the efforts of large landowners to maintain the loblolly pine subclimax.

The use of new chemicals and new mechanical equipment promises to spread at a rapid rate. These new methods offer wide possibilities for the manipulation of the forest far beyond what might have been accomplished earlier, with repeated and expensive hand-cutting methods.

On farm woodlands and other small ownerships, it is expected that there will be a certain time lag in application of some of the new techniques. The proper use of fire is beyond the competence of many small owners, and most of them lack heavy mechanical equipment. These methods are best suited to the growing of even-aged stands on large industrial ownerships. Farmers, on the other hand, can exercise closer utilization of the low value hardwoods for fuelwood and other farm used, and have shown interest in chemical methods for controlling undesirable species.

The problem of maintaining the loblolly pine subclimax will ultimately be greatly eased by more intensive utilization of, and greater demand for, hardwood species for chemical conversion and other new uses. Unless history fails to repeat itself, time should in some measure catch up with the "inexhaustible" supply of mediocre hardwoods in the loblolly pine-hardwood type of forest.

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Commodity Report

European Pitprop Supplies

THE pitprop supply situation in Europe, which at the beginning of 1950 had not raised any particular fears, was still considered to be satisfactory during the sixth session of the ECE Timber Committee, held in Geneva in April 1950. (*Note*: FAO provides the technical secretariat for the ECE Timber Committee). The import requirements of the main pitprop consuming countries were expected to be met by the potentialities of exporting countries, although a certain gap existed between forecasts of needs and expected supplies. This, however, was thought to be due to the usual over-estimation of import requirements, and the under-estimation of export possibilities.

A sudden increase in the demand for pulpwood towards the end of 1950, however, considerably changed the situation. Thus in October, 1950, the seventh session of the ECE Timber Committee found the gap between import requirements and export possibilities had widened, and amounted to 677,000 solid m^3, or 5 percent of total pitprop requirements, as against the earlier assumption of only 3 percent of total pitprop requirements. It was considered too late in the season for much likelihood of the gap being filled by further purchases for delivery in 1950, and therefore it was thought likely that consuming countries would have to draw on stocks more than anticipated. Thus the situation at the close of 1950 already showed signs of deterioration.

Production and Consumption in 1950

Although the net pithead production of hard coal in Europe had increased about 3 percent over production in 1949, consumption of pitprops was estimated to have increased to a less extent. This was due to economies in the use of pitprops in the mines as well as to the increased use of steel props. No statistics on European pitprop consumption, (excluding the U.S.S.R.) during 1950 have been available, but it may be put at about 15,100,000 m^3, as against an estimated 14,900,000 m^3 in 1949. As the total European availabilities in 1950 (excluding the production of U.S.S.R. and Eastern Germany for their own use, but including their production for export, and Canadian imports to Europe) may be estimated at 13,385.277 m^3 as against about 14,730.345 m^2 in 1949, it was obvious that stocks had been heavily drawn upon in the course of the year. Information available seems to indicate that while stocks in most European countries showed considerable increases during 1949, and by the end of the year, in the western European countries only, were estimated at about one million m^2 higher than at the beginning of 1949, stocks in the same countries (particularly in Belgium, France, Western Germany and United Kingdom) together showed a decrease of about 1,300,000 m^3 in the course of 1950.

TABLE 1 — PITPROP PRODUCTION

	Forecast for 1951 in October 1950	Actual 1950	Forecast for 1950 in October 1950	Actual 1949
	Cubic meters			
Austria	343 000	170 800	300 000	208 700
Belgium	850 000	815 000	850 000	850 000
Czechoslovakia	(670 000)	(680 000)	(680 000)	(680 000)
Finland	[1]750 000	[1](870 000)	[1]700 000	1 133 900
France	2 700 000	2 100 000	3 150 000	1 800 000
Germany: (Western)	3 000 000	2 929 700	3 000 000	3 245 700
Hungary	100 000	(100 000)	(100 000)	(100 000)
Ireland	(14 000)	(14 000)	(14 000)	(14 000)
Italy	125 000	111 100	125 000	111 200
Luxembourg	60 000	70 342	(60 000)	89 576
Netherlands	80 000	92 000	80 000	79 800
Norway	[1]100 000	50 000	[1]100 000	101 000
Poland	1 816 000	(1 816 000)	(1 816 000)	(1 816 000)
Portugal	240 000	(240 000)	(240 000)	212 000
Spain	1 000 000	(1 000 000)	(1 000 000)	(1 000 000)
Sweden	450 000	268 000	160 000	[3]661 000
Turkey	71 000	83 000	(71 000)	67 000
United Kingdom	630 000	642 500	630 000	636 300
U. S. S. R.	[1,2]900 000	[1,2](850 000)	[1] (900 000)	[1,2](700 000)
Yugoslavia	80 000	[1]117 735	[1] 100 000	[1]189 309
TOTAL EUROPE	13 959 000	13 020 177	14 076 000	13 [illegible]
Canada	[1,4]300 000	365 100	[1,4]350 000	1 654 800
U. S. A.				
GRAND TOTAL	14 259 000	13 385 277	14 426 000	14 730 345

1 Production for export
2 Including Eastern Zone of Germany
3 Exports to Western Europe as reported by importing countries, plus estimated exports to Eastern Europe
4 Additional quantities available against demand
... Not available
Brackets indicate estimates

Table 1 shows actual European production of pitprops in 1949 and 1950, as well as the forecasts for 1950 and 1951 production. From this table the fact clearly emerges that the production of the main exporting countries (Finland, Sweden and Poland) was slightly above the forecasts, and that most of the consuming countries produced quantities more or less equal to the forecasts. France, however, produced only about two-thirds of the planned 1950 production. This was due no doubt to the unusually large stocks of pitprops in the country at the beginning of the year, also to a smaller utilization than had been expected of fire-damaged timber from the Landes. The strong competition from pulpwood is also thought to have affected the production of pitprops to some extent. In fact, the cessation in 1949 of practically all deliveries of small-sized industrial roundwood from Western Germany to France had put the French pulp industries in a difficult position. The total quantities of this roundwood marketed yearly in Europe do not vary greatly from year to year. In consequence, France, instead of receiving large quantities from Western Germany, now has to compete with it for the amounts available from exporting countries, since Western Germany also planned to increase considerably its imports of both pitprops and pulpwood, and, at the same time, reduce the level of exploitation of its own forest resources, which had been largely over-exploited.

The decline in Norwegian pitprop production by about 50 percent was also a result of the competition from pulpwood, insufficient domestic supplies having even forced the Norwegian pulp industries to revert to larger imports of this raw material from Finland and Sweden.

Imports

Although estimated import requirements of pitprops in 1950 were put at 3,997,000 m^3, only about 2,918,000 m^3 were actually imported during the course of the year. This is shown in Table 2, which gives imports in 1949 and 1950, as well as import forecasts for 1950 and 1951.

Table 2 — Imports of Pitprops

	Estimated import requirements for 1951 in Oct. 1950	Actual 1950	Estimated import requirements for 1950 in Oct. 1950	Actual 1949
		Cubic meters		
Belgium	400 000	199 290	400 000	281 100
France	100 000	300 000	450 000	958 000
Germany (Western)	400 000	112 400	250 000	—
Hungary	50 000	(50 000)	(50 000)	(50 000)
Italy	—	6 490	—	1 410
Luxembourg	10 000	17 435	(10 000)	4 712
Netherlands	100 000	60 763	125 000	202 729
Poland	450 000	(450 000)	(450 000)	(450 000)
Spain	50 000	(30 000)	(30 000)	(12 000)
Sweden		106	—	—
Turkey	132 000	132 100	132 000	142 500
United Kingdom	2 470 000	1 559 500	2 100 000	2 390 100
Total Europe	4 102 000	2 918 078	3 997 000	4 492 551

— Nil or negligible
Brackets indicate estimates

The most striking changes took place in the import of Belgium, France, the Netherlands and the United Kingdom. It is obvious that even here developments were to some extent affected by the pulpwood situation. In some cases, too, importers of pitprops were unwilling to pay the rather high prices asked by exporters at the beginning of 1950. These prices had, as is customary, been influenced by the rise in pulpwood prices. Many importers had hoped for a decline in prices later in the year, and when no decline took place, they were unable to find new supplies of pitprops even at the higher prices they were now prepared to pay.

Exports

Although exports of pitprops from European sources in 1950 exceeded forecasts by about 2.2 percent, they were slightly below the 1949 exports, and also substantially below the estimated 1950 import requirements. The main northern exporting countries, Finland and Sweden, exceeded the amounts forecast, as they have done in all post-war years. (Norway, however, exported only about half the planned quantity for the reason given above). Most central European countries also exported more than had been estimated in October 1950, and also more than in 1949. It is interesting to note the increase in exports by eastern European countries (Czechoslovakia and Poland) proving that quantities available for export in these countries were in fact larger than the cautious estimates had shown.

Prices

The slight drop in pitprop prices at the beginning of 1950 was no doubt due to the decline in the prices of pulpwood towards the end of 1949. While prices paid for pitprops in 1949 varied between 290 and 305 shillings per fathom f.o.b., the prices paid for half-barked pulpwood were around U.S.$ 8.50 and $ 10 per cubic meter f.o.b. (piled). At the beginning of 1950 pulpwood prices, however, had dropped to about U.S. $ 7 per cubic meter f.o.b., which consequently brought pitprop prices to about 270 shillings per fathom f.o.b. at which price the first contracts with northern countries were signed. The steady increase in pulpwood prices towards the summer of 1950 had an immediate effect on pitprop prices, which, in contracts concluded towards the end of the year, averaged 394 shillings per fathom f.o.b. By the end of 1950 pulpwood prices had already reached as much as U.S. $ 10.50 per cubic meter f.o.b. and still showed a strong upward trend. Therefore the first contracts for 1951 pitprop deliveries fetched record prices, and 400 to 410 shillings per fathom f.o.b. was currently paid by the western European importing countries.

Outlook for 1951 and 1952

Requirements

The total requirements of new pitprop supplies in the main pitprop consuming countries (excluding Spain) were estimated by the seventh session of the ECE Tim-

TABLE 3 — EXPORTS OF PITPROPS

	Estimated exports for 1951 in Oct. 1950	Actual, 1950	Estimated exports for 1950 in Oct. 1950	Actual, 1949
	Cubic meters			
Austria	120 000	94 000	83 000	79 800
Belgium	50 000	26 970	50 000	10 700
Czechoslovakia	—	[1] 16 450	(10 000)	[1] 4 800
Finland	750 000	869 091	700 000	1,133 950
France	200 000	185 000	350 000	140 000
Germany (Western)	100 000	360 700	250 000	700
Hungary	—	—	—	—
Ireland	(12 000)	8 087	(12 000)	7 275
Italy	—	50	—	700
Luxembourg	(50 000)	134 905	(65 000)	51 000
Netherlands	—	—	—	—
Norway	100 000	50 144	100 000	100 970
Poland	(200 000)	[1] 203 367	(200 000)	[1] 38 500
Portugal	(200 000)	(150 000)	(200 000)	210 100
Sweden	400 000	243 300	220 000	660 800
Turkey	—	—	—	—
United Kingdom	—	—	—	—
U. S. S. R.	[2] (900 000)	[2,3] (850 000)	[2] (900 000)	[1,3] (700 000)
Yugoslavia	80 000	117 735	100 000	189 300
TOTAL EUROPE	3 162 000	3 310 509	3 240 000	3 338 270
Canada	[4] 300 000	62 100	50 000	709 700
U. S. A.	...	...	...	—
GRAND TOTAL	3 462 000	3 372 609	3 290 000	4 047 970

[1] Exports to Western Europe only, as reported by importing countries
[2] Including Eastern Germany
[3] Exports to Western Europe as reported by importing countries: 344,644 cu. m. in 1950 and 193,180 cu. m. in 1949. Balance represents estimated exports to Eastern Europe
[4] Additional quantities available against demand
— Nil or negligible
... Not available
Brackets indicate estimates

ber Committee at 13,979,000 m³ in 1951, as against 14,228,000 m³ in 1950. The difference was largely due to expectations of large quantities of pitprops being available in France from the timber damaged by the forest fires in the Landes. These quantities, however, have not turned out to be as great as expected. The total European availabilities in 1950, including imports from Canada, were in fact about 1,000,000 m³ less than the above forecast of requirements, so that it is more than likely that in 1951 also requirements will either have to be cut or domestic pitprop production in the main consuming countries will have to be increased and considerably larger quantities imported from Canada. If efforts to stabilize the pitprop supply situation in 1951 were to fail, the repercussions on the situation in 1952 would no doubt lead to a serious deterioration in the supply position, particularly as the further increase in coal production planned for this year also necessitates a considerable increase in pitprop availabilities. Where all the pitprops required are to be found will be one of the main problems in the European timber supply picture for 1952. Although the export possibilities of eastern European countries could no doubt be considerably increased, it is doubtful under present uncertain conditions whether imports from these sources to Western Europe could actually be stepped up. Any increase in these exports is likely to depend largely on the kind of merchandise western European countries are willing to offer in order to obtain more timber from eastern Europe.

As already shown in Table 2 the import requirements for 1951 of the main European pitprop consuming countries show a considerable increase over the 1950 requirements. The fact recorded 1950 imports of pitprops were well below the planned import requirements for that year and consequently resulted in a heavy drawing upon stocks in most countries, will no doubt further increase the 1951 import requirements. Furthermore, the planned increase in the production of hard coal for 1951, i.e. 553,248,000 tons, as against 539,031,000 tons in 1950, will necessitate larger pitprop supplies than in previous years. The production of hard coal in Europe in 1949 and 1950, as well as the planned 1951 production by countries appear in Table 4 below:

TABLE 4 — PRODUCTION OF HARD COAL
(excluding open cast)

	Forecast for 1951	1950	1949
	Million metric tons		
Austria	228	[1] 185	189
Belgium	28 700	27 304	27 850
Czechoslovakia	18 000	18 456	17 150
France	50 960	50 843	51 190
Saar	16 100	15 100	14 262
Germany: (Western)	[1] 118 600	110 755	103 247
Ireland	160	180	120
Italy	1 600	1 028	1 100
Netherlands	12 250	12 247	11 705
Norway	350	340	108
Poland	81 000	78 001	74 104
Portugal	350	449	441
Spain	10 000	11 000	10 000
Sweden	200	205	200
Turkey	...	4 300	4 200
United Kingdom	212 300	207 457	205 950
Yugoslavia	1 350	1 195	1 274
TOTAL	553 248	539 031	523 488

[1] Excluding French zone
... Not available
Brackets indicate estimates.

Production

The estimated European production of pitprops in 1951 shows an increase of about a million m^3 over the actual 1950 production. A closer study of Table 1, however, makes it seem rather unlikely that this increase can be attained. In particular, estimated increases in the Austrian and Swedish, as well as in the Norwegian, production of pitprops seem unlikely, as all these countries are at present concentrating on increased pulpwood production, and even plan increased imports of pulpwood during both 1951 and 1952. Furthermore, since these countries are not important pitprop consumers, government pressure cannot easily be used to secure a sufficient, or at least the highest possible, pitprop production, as is the case in France and Western Germany, where mining is of vital importance to the country's whole economy.

Export possibilities

A study of Table 3 makes it seem more than probable that the 1951 export volume from European sources will not attain the 1950 level. As already mentioned above, the production, and consequently the export possibilities, of pitprops from countries such as Austria, Sweden and Norway, will probably remain well below the forecasts. For example, in Sweden it is feared that contracts under existing trade agreements to deliver in the course of 1951 about 400,000 m^3 of pitprops and about 100,000 m^3 of pulpwood would greatly endanger the activity of Swedish pulp industries, which are already suffering from a shortage of raw materials. In fact, the granting of export licences for pulpwood was discontinued in the summer of 1951. In Finland, the largest roundwood exporter in Europe at the moment, the present high level of roundwood exports has also caused some anxiety in industrial timber circles and it is feared that their continuation at this level may endanger the sound development of Finnish wood working industries. Also, it seems unlikely that during 1951 France will be able to export as much as planned in October 1950, and any increase in exports in 1952 seems still more unlikely. The only way to close the gap resulting from the decrease in exports from most countries would no doubt be a substantial increase in Canadian exports of pitprops to Europe, which, if on the 1949 level, would greatly ease the European pitprop situation. This is well within the limits of possibility, as the only country in Europe that depends mainly on foreign supplies is the United Kingdom, which is traditionally almost the sole importer of Canadian pitprops in Europe. As in all postwar years, the U.S.S.R. remains an unknown factor which might completely change the picture if any agreement were to be reached between it and western European importing countries.

Prices

The great increase in both pitprop and pulpwood prices, already referred to in the section dealing with 1950, continued during the first half of 1951, and U.S. $ 16 to $ 17 per piled cubic meter of half-barked pulpwood f.o.b. (around 700 shillings per fathom f.o.b.) was currently paid for contracts concluded at the end of this period. The corresponding price for pitprops at the same time, was generally estimated at around 600 shillings per fathom f.o.b. Any further changes in the pitprop prices depend entirely on the development of pulpwood prices during the second half of 1951. So far the price situation seems to have stabilized somewhat, and in many quarters the present level is considered as a ceiling. The development of pitprop and pulpwood prices, however, depends on so many imponderables, that, as past experience has shown, it is too hazardous to make any definite predictions.

Competition from Pulpwood

The increasing influence of pulpwood on the market for small-sized industrial roundwood emerges from the fact that while European and U.S.S.R. exports of pitprops slightly declined, (2,460,509 m^3 in 1950 as against 2,638,270 m^3 in 1949), exports of pulpwood practically doubled, and were 3,017,753 m^3 in 1950 as against 1,690,295 m^3 in 1949. Exports of pulpwood from eastern European countries, which in 1949 were only 8,500 m^3 (from Czechoslovakia only) rose to 140,650 m^3 in 1950. Moreover, imports of pulpwood by western European countries, which in 1949 were 2,169,382 m^3 had in 1950 risen to 2,702,099 m^3.

TABLE 5 — PULPWOOD

	Imports		Exports	
	1950	1949	1950	1949
	Cubic meters			
Austria	87 400	185 300	*	
Belgium	218 580	54 300	1 910	23 900
Czechoslovakia	...	...	1 060	8 500
Finland	...	2 362	1,882 293	845 900
France	161 000	680 000	18 000	*
Germany (Western)	638 400	217 600	107 400	300
(Eastern)	...	...	4 970	...
Italy	355 160	36 120	520	420
Luxembourg	—	—	200	30 348
Netherlands	251 400	242 000	—	—
Norway	216 659	62 700	1 808	
Poland	...	...	90 570	
Portugal	...	24 700	...	25 600
Sweden	501 900	430 400	256 400	129 100
(Switzerland)	33 900	99 000	13 000	...
Turkey	—	27 700	...	...
United Kingdom	237 700	101 200	—	—
U.S.S.R.	...	...	44 050	...
Yugoslavia	...	...	595 572	626 127
TOTAL EUROPE	2 702 099	2 169 382	3 017 753	1 690 295
Canada [1]			92 700	76 600
GRAND TOTAL	2 702 099	2 169 382	3 110 453	1 766 895

[1] To Europe only
* Small
— Nil or negligible
... Not available

The import requirements of these countries in 1951, however, were growing more rapidly than in the case of pitprops, and were estimated to be about 4,000,000 m^3 in 1951 and around 5,000,000 m^3 in 1952. Further increases in the next few years are considered to be inevitable, if the western European pulp and paper industries are to meet the strong demand or even maintain their present levels of production. In order to secure sufficient quantities of raw material, efforts are being made to find means of employing species other than conifers for pulping. This, however, needs time,

also the problem of finding sufficient quantities of such pulpwood remains unsolved. Therefore the present competition for small-sized industrial roundwood is reflected in high prices which has caused a serious situation in western European pulp industries.

Conclusion

As already explained above, the European situation of small-sized industrial roundwood suddenly deteriorated towards the end of 1950 and has since then shown no change for the better. It is difficult to make any statement on the pitprop or pulpwood situations separately, as both these categories of roundwood are closely related to each other. The fluctuating demand for pitprops and pulpwood traditionally allowed large-scale stockpiling of one category at the expense of the other, and the situation on the whole was until recently well under control. Now, however, the demand for both these categories is unusually strong and no change appears likely in the future. The situation must, therefore, be considered as potentially serious. The pitprop requirements of the main industrial countries, Belgium, France, Western Germany and the United Kingdom, are considered to be absolutely essential for these countries' industrial activities, which in their turn are greatly dependent on the production of coal. The Korean conflict and the resulting re-armament program in Western Europe make it still more important to increase the present level of coal production in these countries. At present, however, it seems doubtful whether pitprop supplies available for western Europe today will allow even the present level of coal production to be maintained. The United Kingdom, which is chiefly a pitprop-consuming country, its pulpwood consumption being insignificant, may always be expected to revert to larger pitprop purchases from Canada. Thus a possible shortage of pitprops in the United Kingdom will not necessarily affect the European situation. France and Germany, however, present a different picture. These countries, both of which are at present large scale consumers of pitprops as well as of pulpwood, find themselves in a different situation. The pitwood resources of both countries have during the past years greatly decreased, those of France as a result of disastrous forest fires, and those of Western Germany as a result of large scale over-exploitation. Thus, both France and Western Germany are now forced to revert increasingly to imports, mainly from European sources. Most of the traditional roundwood exporting countries, however, as mentioned above, show signs of reluctance towards increasing their exports of roundwood, in some cases towards any exports of roundwood at all. The only country with substantial timber resources and which might still enter the European roundwood market on a large scale remains therefore the U.S.S.R., but, at least under present conditions, any substantial increase in roundwood exports from this country to western Europe appears to be rather speculative.

Note : During the eighth session of the Timber Committee of the Economic Commission for Europe, 28-31 Aug. 1951 consultations were organized between working parties appointed by the Timber and Coal Committees. The estimates of these working parties showed for 1952 a pitprop deficit of more than 2 million m^3, but it is conceivable that actual exports might be somewhat higher than anticipated and thus reduce the size of the gap. Even so, the shortage of pitprops caused by the competing claims for pulpwood had assumed serious proportions and might interfere with the planned increase in coal output in several countries.

The Timber Committee therefore drew the attention of governments to this critical situation, and recommended that measures be contemplated to increase in the major coal producing countries the domestic production of pitprops, and in the major wood exporting countries to give priority to export sales of pitprops. The priority for pitprops constituted, however, a short-term measure only, and should be limited to the essential requirements of coal-mines which might be revised by the Coal Committee in the light of the present shortage. The Timber Committee further stressed the need to make pitwood contracts at the earliest possible moment and recommended that governments encourage and facilitate such transactions.

The Timber Committee believed, on the other hand, that the shortage of small sized roundwood and the intensive competition for pitprops and pulpwood was not just a temporary phenomenon, but showed indications of becoming increasingly severe. The Committee therefore decided to include the review of the European pulpwood situation on the agenda of its next session and instructed the Secretariat to extend the scope of its quarterly timber statistics and bulletins to pulpwood as well. This should enable the Committee to undertake at its future sessions periodic reviews of pulpwood in the same way as is done with regard to other wood categories. It further requested the Executive Secretary to study, in co-operation with FAO, appropriate measures to overcome the apparent growing shortage of small sized roundwood and to submit these proposals to the Committee in due course. These proposals might also take into consideration the conclusions reached in the European Timber Trends Study, which the Secretariat has nearly finished.

The Work of FAO

Expanded Technical Assistance Program

Technical Assistance in Forestry

Sufficient time has now elapsed since the inauguration of the Forestry program under the Expanded Technical Assistance Program (ETAP) for certain trends to appear and conclusions to be drawn from them. As will be seen by the table on page 122 the Forestry Division now has 65 experts in 22 countries. Agreements with countries have been of three kinds: firstly, individual experts to make general recommendations regarding forest policy and development; secondly, specialists on specific projects; and thirdly, well organized missions to make more thorough studies of the forestry situation and possibilities of economic development.

The countries seeking forestry assistance fall into two main categories, namely, those with no, or very rudimentary, forestry administration where experts must start from scratch, and those with fairly well organized forest services, but which are lacking in modern techniques of extraction and the processing of forest products.

A further feature worthy of note is that some countries have excellent forest legislation on their statute books, but owing to political, social or economic difficulties stemming from inefficiency of administration, lack of trained personnel, financial problems, or from land tenure conditions, enforcement has proven impossible. In many countries forest exhaustion is proceding apace through the cumulative ravages of shifting cultivation and burning for fodder.

It is becoming increasingly obvious that the cure for these ills cannot be found in the prescription of forestry measures alone. Fundamental questions of land use, including agricultural and pastoral pursuits rooted deep in the way of life of under developed and uneducated rural populations, have to be examined. Joint action affecting many departments of governments and involving social and economic programs of major national importance need to be taken to stop the march of forest destruction and consequent acceleration of soil denudation and erosion.

Experts faced with problems of this magnitude have need of all their reserves of experience and judgment and the full support and counsel of the Forestry Division. In the words of the Chief of one of the Forestry Division's most important missions, "They must not frustrate easily." It is quite evident that technical assistance, to be effective, must be continuous over a period of years and must mean the doing of many things that were not envisaged when the program was initiated.

One important fact has emerged from requests for technical assistance received thus far, namely, the predilection of countries for help in the development of forest industries, irrespective of whether the extent of the forest resources are known or any effective management for continuous production is established. This is but a symptom of the world urge for industrialization to improve standards of living, and, as such, must be treated most sympathetically by FAO. It is, however, the responsibility of the Forestry Division to see that its experts preserve a proper balance and call the attention of countries to the necessity of parallel advance in the organization and management of forest resources.

The accent on problems of industrial development distinguishes Forestry Division activities from those in most other phases of the over-all FAO Expanded Technical Assistance Program. It means thorough consideration of economic and financial problems, not only within the country but in relation to world demand for forest products. The large capital investments required to establish plants for conversion into pulp, fiberboard or other products will often mean recourse to external sources for financing. On the other hand, it is only by establishing such industries, capable of using species now disregarded, that the working of large areas of tropical forests can be planned on an economic basis.

The Division's policy is to leave it to its experts in the field, after examination on the spot, to suggest to recipient countries the nature and extent of the expanded assistance that FAO should provide. Certain basic needs are, however, crystallizing. The first is the requirement in some countries for the immediate provision of a nucleus of trained personnel for the establishment or strengthening of forest administrations. The policy proposed is to accept requests from countries for a senior forestry advisor to the government, and possibly a nucleus of trained sub-professional staff. From the standpoint of FAO this personnel will have advisory functions only. They will, however, be allowed to accept executive duties in a national administration on request of the ministry concerned, subject to agreement that FAO will not be in any way responsible for action taken in pursuance of the exercise of such executive functions.

The second need is the complementary phase of the policy indicated above, namely, an expansion of the fellowship program to send national personnel abroad for training so that, on return, they may take over from FAO experts temporarily assigned as advisors to their governments. Greater attention will be paid also to the possibility of sending forestry officers in existing administrations under fellowships either for specific courses of study to improve their usefulness in their own specialties or to make general tours to acquaint themselves with the latest developments in their particular lines of activity in other parts of the world. An interesting project in this connection is the proposed Eucalyptus Study Tour in Australia. This genus is of great economic importance in plantations in many parts of the world. Species in present use have not been selected on a scientific basis and there is room for great improvement in potential yields by use of species or strains better adapted to the climatic and soil conditions of the plantation areas. An opportunity to view eucalyptus in the many varied environments existing in Australia should prove of great practical benefit.

A third primary need is for facilities for the training of subordinate personnel of sub-professional status (forest rangers, forest foremen, etc.). It is proposed to accept requests from countries for the setting up of national training centers for which FAO will provide instructors, both professional and sub-professional, and essential equipment. Plans for 1952 foresee the possibility of perhaps ten such schools.

A fourth essential requirement is for the further development of regional training centers. The Government of India has offered to make Dehra Dun available as a research and training center for the Far East, and discussions are underway to determine how technical assistance can best be provided to take advantage of this offer. In Latin America, proposals have been made for the creation of a research center in Brazil, possibly using, in part, the facilities of an existing private research organization. This project is also receiving close consideration. A new development is the plan for the setting up of a regional training center for mechanical logging in the Far East.

It is hoped that this will come into being in 1952.

Lastly, there is need for a more liberal policy in the provision of equipment for demonstration purposes in the forestry field proper, this is particularly important in inventory work. It is proposed to supply missions with technical apparatus for the interpretation of aerial photographs, most of which are unobtainable in recipient countries because of exchange or other financial difficulties. The expansion of regional training centers will call for important expenditures in testing and in mechanical logging equipment. New policy directives from the Technical Assistance Board will enable the Division to arrange for procurement of essential needs.

How the Program Is Carried On

The case of Pakistan gives a good idea of the kind of work that is being done.

The Government asked FAO to send three experts (A. Rule, U.K.; F. Cermak, France; J. A. von Monroy, Austria) in forestry and forest products to Pakistan; a wood chemist with special experience in pulp, fiberboard and allied operations; a logging specialist; and a sawmill technician, experienced in the lay-out, organization and management of sawmills for hardwood. Their work was mainly to be concentrated in the Chittagong and Chittagong Hill areas, where new milling and other developments are projected. In addition, FAO sent G. M. Hocking (U.S.A), chemist specializing in medicinal plants, of which there are a considerable number that need further study from the standpoint of economic importance and possible improvement of yields; he has, in fact, already completed his assignment.

At this time, only preliminary notes on the early field work in these areas are available. Some of the comments of the logging expert are worth quoting because they give a vivid impression of conditions encountered in many parts of the world by men sent out on this kind of work.

During a typical period on his first survey trip Mr. Rule traveled 320 miles by river in shallow-draft boats, 200 miles by jeep, 50 miles on foot through forest areas impassable in any other way, and some distance by elephant.

He wrote:

"For the past six weeks or so I have been going as flat out as the local transportation system allows in an effort to cover as much ground as possible before the big monsoon, when all forest travel and operations, except rafting, stop dead. Actually, I got caught for almost a fortnight in a sort of pre-monsoon while in the Chittagong Hill tracts. This wrecked my itinerary schedule, which was largely based on potentially jeepable roads or tracks. On the other hand, it made some river sections temporarily negotiable by dugout canoe, if only 1 1/2 miles per hour upstream...

"On my tour, the early monsoon phase in the Chittagong Hill tracts brought out leeches, sand flies and mosquitoes in great numbers. I have survived all that — even a bad blackwater fever area and the inevitable prickly heat. Not only survived, but enjoyed it....

"From the point of view of reports and correspondance the situation has been hopeless even with the best will in the world. Time and again I have attempted to write when the worst heat of the day has passed, only to be driven nearly mad by flying insects of all sorts, attracted by the lamplight....

"Incidentally, my recent experience of public road transport amply confirmed my worst fears of the danger of launching a mechanization program of any size in the tropics unless backed by adequate communications, repair and service organization and supplies of spares....

"Just before the onset of the monsoon I was able, in the Cox's Bazaar district, to appraise the value of making feeder roads. Forest revenue in one area has more than trebled following the construction of even a rough fair-weather track."

In connection with the mechanization of forest operations this expert notes that many non-technical officials and others who are not technically trained, "would like to rush into mechanization in every field without considering the consequences or the pre-planning necessary, though the bad results, fortunately on a small scale as yet, are everywhere to be seen."

Asia and the Far East

Regional Projects and Programs

The first session of FAO's Forestry Commission for Asia and the Pacific, held at Bangkok, Thailand, in October 1950, recommended that a regional training course in lumber grading be held in Singapore, or Manila, for sawmill foremen as a practical means of increasing efficiency in sawmills. The course which is being arranged will also be an important step toward obtaining international standardization of grading rules for tropical hardwoods, a development which FAO has been actively fostering.

The Government of India has offered to place its Forest Research Institute and Colleges at Dehra Dun at the disposal of the south-east Asia region as a center of forestry research and education. The offer is one which FAO particularly welcomes since it attaches great importance to the regional approach, and also because certain governments are requesting technical assistance scholarships which might, in many cases, best be provided at Dehra Dun.

A regional training course was held at Lahore in 1950 on the economic appraisal of development projects. The course, an outcome of a discussion on the region's needs for investment at the first FAO regional meeting in Singapore a year earlier, covered a period of three months. During that time the Government of Pakistan, the International Bank for Reconstruction and Development, the United Nations and the World Health Organization, co-operated with FAO in conducting a series of lectures, seminars and field trips for more than 50 officials from eight governments in the south-east Asia region. E. Glesinger, of FAO's Forestry Division, lectured on "Forestry Development in Relation to the Economy of Asia."

Planning development programs and projects is a relatively new undertaking for many governments. The International Bank for Reconstruction and Development and other agencies found, in the early stages, that many of the projects submitted were not adequately considered in all their aspects and, in some cases, did not have a sufficiently sound basis to justify loans or the commitment of highly trained technical people from outside. The Lahore school was intended to help responsible government officials to do an adequate job of discovering and appraising development possibilities in their countries, and to put the proposals into such form that they would be convincing to those responsible for providing technical or financial aid, including the International Bank for Reconstruction and Development, the U.S. Export-Import Bank, FAO, the bilateral Point Four organizations of the U.S.A., and the governments co-operating in the Colombo Plan.

The course in Pakistan was so successful that two more courses of the same type have been scheduled this year: one in Ankara, Turkey, for the Mediterranean Basin, beginning 1 October, and one in Santiago, Chile, for Latin America, beginning 26 September. [1]

Country Projects and Programs

Burma. Burma has been receiving help from FAO in forestry production. The country has large under-populated areas and rich forest resources, capable of much greater development. Teak is third in importance among exports. At the Government's request, FAO sent a forestry expert (J. A. von Monroy, Austria) to Burma in the latter part of 1950 to select a forest area suitable for the integrated development of forest industries, and to draw up working plans and estimates of capital cost. K. A. Miedler, Australia, has been appointed as logging expert. Two fellowships have also been provided for senior Burmese forestry officers.

[1] Two publications, both published by the Technical Assistance Administration of the United Nations in New York, resulted from the Lahore School: *Report on the Asian Center on Agricultural and Allied Projects*, 2 Oct.-15 Dec., 1950, pp. 38, a narrative account of the course; *Formulation and Economic Appraisal of Development Projects*, in two volumes, pp. 783 - the lectures given at the school.

Ceylon. In Ceylon there is a fairly well-balanced program of technical assistance, involving 15 experts and covering various aspects of agriculture, forestry, fisheries and nutrition. The forestry experts include a woodworking machinist (J. Mc Veigh, U.K.) to train local staff for a shop-laboratory to carry on research in the working qualities of Singhalese timber, and a forestry engineer (A.C.Décamps, France) who is advising the Government on logging and timber extraction operations and the construction of forest roads.

India. One expert on wood technology (F.F. Kollmann, Germany) has already been sent to India and two other forestry experts will be sent in addition to a specialist in sawmill operation (V. Hasek) and an expert to investigate the setting up of a wood pulp mill. Two Fellowships will also be provided.

Indonesia. The people and the new Government of Indonesia need help in rebuilding their country.

In March 1950, a group of experts from the United Nations, including representation by FAO, made a preliminary survey of Indonesia's needs for technical assistance. Subsequently, several United Nations agencies have provided a number of experts to serve for long periods in the country. Two of these, concerned with agriculture and forestry, are from FAO.

Nepal. Nepal is not yet a member of FAO, but the Government is seeking the assistance of four experts to advise on farm management and the integrated development of forests and agriculture. The work would fit into a governmental program to develop the agricultural, forest and mineral resources of Nepal to achieve a higher standard of living for its people. Technicians sent by the Swiss Confederation have been in the country for some time carrying on background investigations which will provide the basis for further development of farms and forests.

Pakistan. Technical assistance work in Pakistan has been described earlier.

Thailand. A forestry management expert (A. N. Barker, U.K.) is advising on the formulation of working plans ; a forest plantation expert (C. Letourneux, France), on the organizing of large scale plantations and the training of personnel in the use of mechanical equipment ; an expert in forest surveying (J. W. Gonggryp, Netherlands), on organizing a unit and initiating a program to survey forest resources ; and an expert in sawmilling techniques (K. G. McAlister, U.S.A.), on the modernization of sawmills.

The Near East and Africa

Regional Projects and Programs

A project of great potential significance is the proposed African Training Center for Agricultural Statistics which FAO has been discussing with representatives of several metropolitan governments. The proposal originated after the establishment of the European Center of Applied Statistics and Demographics in Paris, in 1949.

One of the reasons why so little is known about so much of Africa is that statistical information, including agricultural statistics, has not reached a very advanced stage of development there. For one thing, it is extremely difficult to discover and report the facts about large parts of these great under-populated and primitive territories ; it requires special statistical techniques, and the methods employed in other countries often cannot be applied without considerable adaptation. In addition, official statistical services are often meager, and, in many cases, more training is needed. The proposed training center would be designed to help meet both these needs.

The project was submitted to the African Statistical Conference, held in Salisbury, Rhodesia, July - August, 1951. The Conference "generally agreed that the need for such a center is urgent." Details of organization and program were discussed and agreed upon.

Country Projects and Programs

Cyprus. Heavily over-grazed lands in the foothills of Cyprus take up about a third of the island. The over-grazing brings about low productivity and serious soil erosion so that silt is dumped in large quantities on the cultivated croplands below.

Proper regulation of grazing and maintenance of the soil cover might double the carrying capacity of the foothills area for livestock, besides lessening damage through erosion. FAO has sent an expert on range management and soil conservation under similar conditions (A.B. Cashmore, Australia) to advise the Government. Later, it is possible that Cyprus may be used as a demonstration center for grazing land adjustments applicable to the Near East, where sheep and goats, in many places, play an important part in the agricultural economy.

A regional meeting was held in Cyprus early in 1950 on land use and soil conservation problems.

Ethiopia. The forests of Ethiopia are reported to be rich in valuable trees. The forestry expert sent by FAO (E.H. Swain, Australia), is now making a thorough survey of the possibilities of development. In due course he will advise the Government on the formulation of a sound forest policy and forestry legislation, as well as on the setting up of an adequate forestry service.

Iran. A specialist in forest range management (V. Carocci Buzi, Italy) is to study conditions and problems and supervise the establishment of experimental areas to demonstrate the application of good modern practices ; an agronomist, specializing in range management, is to work with the forest range specialist, particularly on seeding adapted varieties of grasses and introducing forage production on croplands to relieve the pressure on forest ranges and pastures. Besides the range specialist already mentioned, an expert on forest utilization (E. Uhart, France), is in the country, to study particularly the charcoal problem, since the widespread use of charcoal as fuel is a large factor in depleting the forest resources of the country, and an expert on wood technology (W. Varossieau, Netherlands) is there to start a program of research work with students in the Forestry Post-graduate Division of the University of Teheran.

Syria. According to the latest news, the Government has recently signed an agreement with FAO for technical assistance in forestry. This agreement will include a request for forest specialists and six fellowships ; the specialists will comprise an expert on forest inventories and management, an expert on reforestation and soil conservation and an expert on afforestation. The necessity for protecting and improving existing forests and carrying out reforestation work, soil conservation, and tree planting outside forested areas, in conjunction with agriculture, is now generally recognized by the Government.

Latin America

Regional Projects and Programs

The Latin American Forestry and Forest Products Commission held its third session in Santiago, Chile, 11 December 1950, and among other topics, examined progress made regarding the proposed Forest Research and Training Institute for the region.

The Commission instructed FAO to ask Member Governments for a clear and final expression of their views regarding the setting up of such an institute. This has been done in a memorandum recounting the history of the project.

Country Projects and Programs

Brazil. Brazil is carrying out a program of economic and social development, partly as an outcome of the Salte Plan, with direct assistance from the Government of the U.S.A. To help round out this development program, FAO services are being provided, or are proposed, in connection with forestry, agricultural technology, fisheries, rural welfare, nutrition and food technology. A Brazilian technical assistance committee and the FAO office in Rio de Janeiro, Brazil, are co-ordinating activities in the program as a whole.

The fact that Brazil has vast forest resources, which are not used to anything like their full capacity, throws great emphasis on forestry in the development program. We are asked to provide the services of three forestry experts, who would be concerned with the development of forest resources and industries in the

Amazon valley. These comprise an export on modern logging methods (K. McGrath, Australia), one on forest industries (R. Gachôt, France) and a third on marketing. Arrangements would be made for consultation with the International Bank on finance and credit questions as the Amazon project progressed.

The Government of Brazil is also considering the establishment of a research laboratory and pilot plant for the pulping of tropical species of hardwoods. The country imports considerable quantities of pulp and paper products, which it might well supply from its own huge timber resources and perhaps even ship to other Latin American countries.

Chile. A mission to Chile is headed by an expert (E. I. Kotok, U.S.A.) on forest policy and research and includes A. Cosigny (France) and C. Pilla (Italy), experts on reforestation and soil conservation, A.H. Stein (U.K.) for forest management, and L. Hartmann (Finland) for forest industries. This group is concerned with general forest policy and the organization of a national program of forest research ; the protection of areas in northern Chile from the encroachment of the desert by reforestation and other land rehabilitation practices; afforestation and rational exploitation of forests in southern Chile, where extensive areas of commercial timber are located ; soil conservation and protection of natural renewable resources ; development of forest industries.

Colombia. Colombia has under way a comprehensive technical assistance program in which several United Nations organizations are co-operating. This program developed in part out of recommendations made by a previous mission of the International Bank for Reconstruction and Development. FAO is providing five of the ten experts working on the program as well as the technical assistance representative for the whole group. Among these experts is a forester (M. von Bottenburg, Netherlands), who is making a basic survey of all aspects of the forest economy, as a first step in formulating detailed proposals for a well-rounded development program. Two further experts on forest inventories and industries are being recruited.

Guatemala. A forester (M. Rocher, France) has been in Guatemala since last October and two forest entomologists (G. Becker and F. Schwerdtfeger, Germany), have also been sent. This is in connection with the broad program of the Guatemalan Government for forest development, designed in part to offset damage done by unwise exploitation, which has helped to favor heavy insect infestations, especially of bark beetles in pine. The basic aim of our work is the adoption of a sound forest policy which will include the protection of forest resources in the interests of flood control and stabilization of watercourses. Much attention is being given to the training of forestry personnel to carry out such a policy.

Haiti. FAO has provided a forestry adviser (L. Burns, U.K.), to assist the Government in a program of reforestation and soil conservation, including the possible development of large enough supplies of forest products to meet the domestic needs of Haiti and furnish a surplus for export.

Honduras. Honduras has exceptionally rich forest resources (Honduran mahogany is world famous), but they are being wasted, in the pine region particularly, by indiscriminate cutting and tapping for resin, and by the burning of the forest cover for shifting cultivation and grazing on steep slopes. The Government is endeavoring to work out a new national forest policy, and an expert (C.E. Simmons, U.K.) has been sent to make an initial survey of the problem and help prepare recommendations.

Mexico. The forest policies of Mexico are among the most progressive in Latin America. In connection with the program to conserve forest resources and utilize them economically and rationally, the Government has asked FAO for advisory assistance. Under the leadership of D.T. Griffiths (U.K.) the following five experts have been sent to Mexico : L. Huguet, (France) ; G. H. Bernier, (Canada) ; P. Allouard, (France) ; a sawmill expert, P. E. Poyry, (Finland), and an entomologist, J. Miller, (U.S.A.). Their assignments are to organize forest investigations which will include reforestation of tropical species and conifers ; problems connected with the lumber industry in the coniferous woods of the northern region ; measures for the protection of forests against insect and fungus diseases ; the making of forest inventories ; and laboratory investigations of forest products. A further specialist on afforestation of arid zones is being recruited.

Paraguay. Following a visit by the FAO regional representative in Rio de Janeiro, an agreement has been made with the Government of Paraguay, under which FAO is supplying two forestry experts. One will make a survey of the forestry situation of the country in order to make recommendations for long-term forest policy, forest legislation, forest protection and reforestation in certain zones ; the other will survey the possibilities of using forest products and the development of forest industries.

Uruguay. In the latter part of 1950 the International Bank for Reconstruction and Development and FAO sent a mission to Uruguay which included nine specialists in agriculture, economics, marketing and forestry, to survey the country's agricultural problems and requirements. The forestry member was H. G. Winkelmann (Switzerland).

Europe

Austria. To advise on various aspects of the forest development and investment program in Austria, FAO is providing the services of two forestry experts for brief periods and those of a sawmill technician (A. A. Simonsson, Sweden), who will be on a year's assignment.

This work is an outcome of the 1950 Forestry Mission to Austria (*see Unasylva Vol. IV, No. 3*). Austria has made remarkable progress in the first year of operation of the program recommended. An Austrian Forestry Commission has been established ; over 90 percent of the capital sums proposed for investment in 1951 have been made available or earmarked, and a substantial portion has been used ; the forest economy is rapidly being expanded and modernized, and exports of forest products are reaching record figures.

Some World-wide Projects

Besides technical assistance to individual countries and regional projects and programs, FAO has a number of services and activities that are essentially world-wide in scope. For example, a major project this year has been a Forest Fire Control Tour in the United States, with three agencies of the U. S. Government co-operating — the U.S. Forest Service, the Economic Co-operation Administration, and the Office of Foreign Agricultural Relations. The work included study courses and demonstrations, starting early in September and continuing for six weeks. The participants visited forest areas in many parts of the country. Twenty-three countries sent senior technicians including Argentina, Australia, Brazil, Canada, Chile, France, Germany, (Fed.Rep), Greece, Guatemala, Haiti, Honduras, India, Italy, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippine Republic, Thailand, U.K., Venezuela and Viet-Nam.

Number of Forestry Experts

Country	Assignment Completed	In the field	Recruited, but not in the field	To be recruited	Total
Austria	—	1	—	—	1
Brazil	—	2	—	1	3
Burma	1	1	—	1	3
Ceylon	—	1	—	1	2
Chile	—	5	—	—	5
Colombia	—	1	—	2	3
Ethiopia	—	1	—	—	1
Guatemala	1	2	—	—	3
Haiti	—	1	—	—	1
Honduras		1	—	—	1
India		2	—	2	4
Indonesia			—	1	1
Iran		2	1	—	3
Libya		1	—	—	1
Mexico		6	—	1	7
Nepal			—	2	2
Pakistan	2	1	1	—	4
Paraguay		1	—	1	2
Surinam		1	—	—	1
Syria			—	3	3
Thailand		1	—	—	4
Yugoslavia			—	2	2
Total	4	34	2	24	64

Second Conference on Mechanical Wood Technology

The second FAO Conference on Mechanical Wood Technology was, by general consent, one of the most successful meetings of its kind. Held at Igls, Tyrol, Austria, 13-16 August 1951, on the invitation of the Federal Government of Austria, the Conference discussed various problems of importance to the technical development of timber resources.

A large number of agreements and recommendations were unanimously adopted relating to technical evaluation of the properties of fiberboards; of veneer, plywood, and other glued veneer constructions; and of timber. The development of uniform principles of stress-grading of structural timber was taken a stage further, while the need for securing improvement in sawing and machining practices, and in the fire resistance of such materials as fiberboards was recognized by the establishment of new study groups to carry on investigations in these fields.

The Conference was preceded, 6-12 August 1951, by meetings of the study groups set up by the first Conference on Mechanical Wood Technology, Geneva, 1949. The consensus of opinion reached at these meetings, under the chairmanship of J. Campredon (France), Chairman of FAO's Technical Committee on Mechanical Wood Technology, enabled the Conference later to dispose of its business with admirable speed. In recognition of the substantial way in which their services contributed to the agreement reached, the Conference expressed its gratitude to the members of the study groups for the time and efforts put into the difficult tasks with which they had been entrusted.

At the conclusion of its plenary sessions at Igls, the Conference adjourned to Zurich, Switzerland, where tours and discussion meetings arranged by Swiss authorities were held from 17-18 August. Visits were made to the Swiss Federal Laboratory for testing materials, the Amsler factory for testing machines at Schaffhouse, and the experimental forest of the Federal School of Technology.

The Conference was attended by 30 delegates from the following countries: Australia, Austria, Canada, Ecuador, Finland, France, W. Germany, Italy, Netherlands, Sweden, Switzerland, Turkey, United Kingdom, and the United States. The International Union of Forest Research Organizations was represented.

Proceedings of the Conference

At the opening session held in the Stiftssäle in Innsbruck, the Governor of the Tyrol was elected Honorary Chairman of the Conference, while L.J. Markwardt (U.S.A.) was unanimously chosen Executive-Chairman, and M. Schlager (Austria) and R.S.T. Kingston (Australia) as Vice-chairmen.

Delegates were welcomed by representatives of the Federal Government of Austria, the Tyrol, the Austrian United Nations Association, the Federal Council for Forestry and Timber, and the Austrian Society of Wood Research. The Lord Mayor of Innsbruck and the President of the Innsbruck Chamber of Commerce also joined in the welcome, after which an official reception was offered at the Hofburg by the Land Government of Tyrol and city authorities of Innsbruck.

The proceedings of the Conference opened with an address by M. Leloup, Director of FAO's Forestry Division, representing the Director-General of FAO, who outlined the main tasks that appeared to him to confront the delegates. These were to arrive at agreed standard testing methods, to bring about wide dissemination and international acceptance of these standards and of other agreements which might be reached, and finally to promote all measures that would lead to forests increasing their contribution to the well-being of the people of the world.

The Conference then adopted a working agenda as follows:

1. Testing methods:
   (*a*) *Timber*
   (*b*) *Fiberboards*
   (*c*) *Veneer, plywood, and other glued veneer constructions.*
2. Stress grading of structural timber
3. Nomenclature of commercial timbers
4. Sawing and machining of wood

The conclusions and recommendations of the Conference with regard to these items are described later.

The Conference heard a report by Prof. G. Giordano, on behalf of the International Poplar Commission, with regard to work carried out on the technology of poplar timbers, and a resolution was adopted endorsing these activities. A progress report was made by E. Moerath, Secretary of the Conference, on the work of the FAO Secretariat, and the development of FAO's Expanded Technical Assistance Program for underdeveloped countries was discussed. The members of the Conference expressed interest in the progress that had been achieved in the comparatively short time since the program started. Members were prepared to assist the FAO Secretariat in selection of experts for specific missions, and to advise on technical matters insofar as this was practicable.

In its formal resolutions the Conference expressed its appreciation to the Federal Government of Austria and other authorities for the excellent arrangements made for the meeting, and also to the authorities in Switzerland for arranging the subsequent study tours. It also invited the Director-General of FAO, in consultation with Member Governments, to arrange in due course, preferably in 1953, for a third international meeting on mechanical wood technology, when the several study groups could report on the assignments delegated to them and further international agreement be sought. The Conference thought it was highly desirable before this meeting to arrange expert discussions by the study groups, particularly the one on stress-grading. It asked the Director-General of FAO to examine ways and means of providing funds to cover the expenses of such meetings.

Before the proceedings came to a close, Mr. Leloup thanked the members of the Conference for their fine spirit of co-operation, and the Conference expressed to its chairman, L.J. Markwardt, its warmest appreciation of the way in which he had conducted the proceedings and brought about the concurrence of views for the final report and recommendations.

Reports of Study Groups

In unanimously adopting the findings of its study groups, the Conference stressed the importance of the conclusions being given practical application. It was agreed that members should take all possible steps to promote within their respective countries the general adoption of such recommendations as were pertinent and should report to the next Conference on the progress achieved. The Conference also requested the Director-General of FAO to distribute its report to all the Member Governments of the Organization so that countries not represented at Igls might also take such action as seemed appropriate.

Fiberboards

The study group reviewed in detail a draft of proposed *Methods of Test for Evaluating Properties of Fiberboards*, prepared by its Chairman (L.J. Markwardt) on behalf of FAO, together with recommended modifications and changes suggested by members as a result of an interchange of correspondence prior to the meeting. The study group reached agreement regarding the methods under consideration and proposed that the draft as amended be accepted as recommended practice.

Consideration was also given to additional tests and procedures that should be studied and developed, with the thought of further extending the

scope and utility of methods of evaluating fiberboards. The additional tests, as established in their relative order of importance, will be developed by the study group for presentation and consideration at the next conference, and include (1) hardness, (2) nailhead pull-through, (3) impact, single and repeated blow, (4) impact indentation, (5) puncture resistance, (6) abrasion, (7) dimensional stability under exposure to water vapor on one side, (8) fire resistance, (9) compression perpendicular to the faces and recovery, (10) acoustical properties, (11) delamination, (12) thermal conductivity, (13) resistance to decay.

The proposed testing methods presented for consideration were prepared in response to a resolution adopted at an FAO meeting on mechanical wood technology in Washington, D.C., in 1947. At that time fiberboards were already in extensive use and were becoming of increasing importance. Some test methods had already been developed in Finland, Norway, Sweden, W. Germany, Australia, America and other countries, and the need for developing generally acceptable standard methods of evaluating properties was apparent. Accordingly, an extensive study was made of existing data on testing methods and a number of special studies undertaken in connection with the modification of certain of the tests that had been previously used, to make them more readily adaptable to available laboratory equipment.

As a result of these studies and various suggestions received, tentative methods of test for evaluating the properties of fiberboard were assembled and presented for comment and suggestion to the meeting of the FAO Technical Committee on Mechanical Wood Technology held in Geneva in 1948. Shortly thereafter, the U.S. Forest Products Laboratory began an extensive series of tests on fiberboard using the newly developed methods.

It was recognized that tests on fiberboards may be required for many different purposes, and that the purpose is the principal factor in determining the number and kind of tests that should be made. In order to make the proposed methods of the broadest possible value, they were prepared on an inclusive rather than an exclusive basis. In other words, any test that was considered to be useful to evaluate some property was included with the thought that if it is desired to make a certain kind of test, a recommended procedure is provided. In this way the procedure can be made of the broadest possible value, without the obligation that all tests included must be made at any one time.

Veneer, Plywood, and other Glued Veneer Constructions

The study group on the Mechanical Testing of Plywood and Allied Materials studied the draft specification submitted for consideration by the representative of the United Kingdom (F. H. Armstrong), and reached agreement on its scope and on procedures to be adopted for tests. The study group was unable, however, in the time available to arrive at a completely standard scheme for testing. Procedures for a number of important tests, namely, panel and plate shear, tension shear, panel impact, glue block shear, and toughness, remained for consideration and in some cases for special study. The study group recommended that the work be continued by correspondence with a view to the preparation of a complete standard scheme for presentation at a future meeting. In the meantime, the study group recommended that :

(*a*) the specification be confined to an evaluation of the properties of veneer, plywood, and other glued veneer constructions and should not apply to special types of construction, such as those with honeycomb or hollow core ;

(*b*) in common with the testing of all wood and wood products, the clauses dealing with the conditioning of the material and the control of temperature and moisture during test be uniform ;

(*c*) the compression, static bending, and tension tests be made in accordance with the procedures described in the A.S.T.M. standard D. 805-47, and that alternative types of test, such as those suggested in the draft scheme considered, be included ;

(*d*) plywood glue shear tests of the types employed in the A.S.T.M., Monnin, and W. German standards be included.

Timber Tests

The report gave a summary of the recommendations of the first Conference on Mechanical Wood Technology with regard to (*a*) general conditions of testing wood, (*b*) compression parallel to grain, (*c*) static bending, (*d*) tension parallel to grain, (*e*) impact bending, and (*f*) compression perpendicular to grain.

In the case of cleavage and tension perpendicular to grain, the Chairman (H. Kühne) reported that only partial work had been possible since 1949 but some progress had been made in the development of a method of testing for tension perpendicular to grain to improve stress distribution. A progress report was given by the U.S. Forest Products Laboratory on tests for shear parallel to grain, impact bending, and tension parallel to grain.

The work of the study group will be continued, following the assignments given at the 1949 Geneva Conference.

Stress Grading of Structural Timber

The study group on stress grading of structural timber held four meetings during the period 7-11 August. At the first meeting, the Chairman (Prof. F.E. Siimes) gave a report on different views of stress grading and on the possibility of co-operation in this field. He presented a summary of different views on specifications for structural grades in different countries, and members reported the developments in stress grading in their respective countries. The desirability of attempting to develop a series of preferred design stresses was agreed on as a means of facilitating the use of wood in the field of engineering materials.

At the second meeting, the natural characteristics of sawn timber (knots, cross grain, etc.) that affect the strength and methods of evaluating them were discussed.

At the third and fourth meetings, ways and means of carrying on the study were discussed and the following agreements reached. In order to promote the more efficient utilization of timber for strength purposes, and to facilitate the marketing of timber for such purposes, it was particularly desirable that an internationally acceptable system covering the principles of stress grading and a series of preferred design stresses be developed. The study group believed that the principles of stress grading and the series of preferred stresses should be applicable to all softwood species, and that the stress intervals should be such as to provide economical design, but should not be so small as to be impracticable from the standpoint of manufacturing, grading, storage and other requirements. The study group further recommended that consideration and study be made of the possibility of employing a series of stress grades applicable to bending, as follows :

kg/cm²	kg/cm²
55	115
70	130
85	145
100	130

The study group agreed that work should be actively continued in order to permit the next meeting of the Conference on Mechanical Wood Technology to consider final recommendations regarding : (1) stress intervals, (2) the enumeration and evaluation of the wood characteristics on which structural grades are based (such as knots, shakes, slope of grain, specific gravity, etc.), and (3) if necessary, the testing and inspection methods to be used.

The group recommended that when such a system of structural grading and preferred stresses was developed and agreed on, that steps should be taken as far as possible in the various countries to co-ordinate the existing practices with the new proposals.

Sawing and Machining

An ad hoc committee of the Conference was set up to discuss manufacturing methods. In view of already significant advances that have

been made in saws and other woodworking equipment, the possibility of further developments through the availability of improved metals and improved grinding and sharpening equipment, and particularly because of the increasing need to reduce waste and improve efficiency in sawing and machining, especially of hardwoods, this Committee recommended that a new study group be appointed to investigate, through correspondence, advances and developments being made in the techniques of sawing and machining. A report with supporting data and illustrations should be prepared for the next meeting of the Conference.

The Conference endorsed this recommendation and adopted a formal resolution to that effect. It recommended further that the widest possible distribution should be given to information on improved sawing and machining methods by the members in their respective countries, because of the great importance of such developments to the improvement of the quality of sawn timber, to efficiency in cutting and machining operations, and to the reduction of waste.

The study group is to be composed as follows, the Chairman being empowered to co-opt other members as necessary: B. Thunell, Chairman (Sweden); Prof. F. E. Siimes (Finland), P. Salenave (France), R.F. Turnbull (Australia), L. J. Markwardt (U.S.A.), L. Vorreiter (Austria), B. Bell (Canada).

Nomenclature

The Chairman (J. Collardet) of the study group on nomenclature reported that there was still a considerable amount of confusion with regard to the nomenclature of commercial timbers, especially in the case of timbers from tropical regions or "new" countries, even though efforts were continually being made by various organizations to clarify or standardize commercial names on the national scale.

However desirable it was to have international uniformity in nomenclature, at least for timbers commonly traded between countries, it was often difficult, if not impossible, to change names established by custom or officially recognized by countries. Standardization was possible for "new" species coming on the market or exported in restricted quantities, so long as varying commercial names had not already been officially adopted in exporting and importing countries.

A certain amount of work on standardization had already been started by FAO's regional forestry commissions and by organizations such as OEEC. The study group recommended that the Forestry Division again ask FAO member countries to submit lists of names of commercial timbers they would like generally adopted in international usage. With the help of the documentation so assembled, the study group would draw up a recommended list of names, with the corresponding variations used in different countries, for consideration at the next conference.

(*Editor's note: The final report is being printed and will be generally distributed in due course*).

International Poplar Commission

THE International Poplar Commission, now in existence for five years, came into being as a result of postwar economic needs when due to the considerable demand for timber great reliance was placed on fast growing species. In addition, the considerable areas of the northern hemisphere, already under poplar cultivation, justified the creation of such a commission. World production of poplar (excluding the U.S.S.R.) amounts to more than 10 million cubic meters annually, and its easy propagation by cuttings makes it the most suitable tree to be intercropped in small agricultural holdings; it is also used on a large scale along roads and waterways, for wind breaks, shelter belts, and other related uses.

Formation of the Commission

As a result of the work carried out in France by MM Ph. Guinier, R. Regnier and G. Meunier, a French National Poplar Commission was created in 1946 as part of the "Conseil supérieur de la propriété forestière non soumise au régime forestier." Early contacts of this Commission with Belgian and Dutch experts confirmed the need to organize study of the problems related to poplar cultivation on an international scale. FAO, which was approached at this time, agreed to sponsor the formation of an International Commission also the conference to precede it. Invitations to this conference, which met in Paris 23-26 April 1947, were restricted to countries which had shown particular interest in the cultivation of poplar. Countries represented at the session were: Belgium, Czechoslovakia, France, Italy, the Netherlands, Poland, the United Kingdom, Sweden and Switzerland. The Secretariat of the International Commission was first established under the auspices of the "Direction générale des eaux et forêts," but was later transferred to FAO, by agreement between the Director - General and the chairman of the Commission, since the latter could in some respects be considered a technical committee of FAO. The rules and statutes of the Commission were approved at the second session held in Venice in 1948. The statutes state that the International Poplar Commission is an agency working under the aegis of FAO but enjoying a certain autonomy, and that it is composed of representatives of national commissions of member countries. It is emphasized that the Commission is one of experts, each speaking on behalf of his own national commission. Technical and administrative matters are submitted to a permanent executive committee, composed of the chairman, vice-chairman and six experts.

National commissions have been established in Austria, Belgium, France, W. Germany, Hungary, Italy, the Netherlands, Switzerland and Turkey. In Sweden the functions of the National Commission are carried out by the "Forest Tree Breeding Institute," and in the United Kingdom by the "Forestry Commission." Through the help of its Secretariat and of participants in the congresses and sessions of the Commissions, the International Poplar Commission has established contacts with experts in Argentina, Canada, Denmark, Lebanon, Syria, the United States and Uruguay.

Since its creation in France in 1947, the Commission has held sessions in Italy, Belgium, the Netherlands, Switzerland and the United Kingdom, which were each attended by an average of 50 delegates representing from 10 to 15 countries. During the sessions study trips were organized in all the countries with the exception of Switzerland. The last Congress, held in England, May 1951, was attended by approximately 70 representatives from 14 countries.

Present Activities

The International Congresses have been exceedingly successful; they have resulted in profitable on-the-spot discussions and the publication of technical reports in the forestry press. Moreover, the Commission's work has been the starting point for other activities in the countries themselves, especially in France where three regional congresses have taken place, in Italy where there has been one, as well as in Belgium, W. Germany and the Netherlands.

Mission to the United States Following discussions by the Commission's Secretary with ECA and OEEC in Paris, the OEEC Council recommended, on a motion of the

Timber Committee, that a mission be sent to the United States to study various problems relating to the culture and utilization of poplar. The objectives of this mission, which took place from 4 May to 9 June 1950, were determined by the Secretariat after consultation with an expert, J. Pourtet. Its final report has just been published and deals with the following subjects: (*a*) indigenous types of *Populus deltoides* Marsh; (*b*) natural stands of aspens and balsam poplars; (*c*) rapid growth hybrids developed by paper manufacturers; (*d*) possibility of selecting the hybrids best adapted to European conditions; (*e*) conditions of production and use of poplars in the United States. This report is at present restricted, but the Secretary of the Commission hopes to get permission from OEEC to have it distributed to Commission members.

Results Achieved

As a result of recommendations made during the Commission's sessions, a number of studies and other activities have been initiated. Since its creation member countries have reported on their production, giving information on the different categories of products obtained. Among the specific results achieved are the following:

Identification Form. This form was drafted and distributed to the National Commissions in order to standardize descriptions of existing poplars and the technical terms currently employed.

Nomenclature. A new nomenclature for poplars of the *Aigeiros* group was drawn up by the Commission and submitted to the International Botanical Congress in Stockholm. The nomenclature, which has already been accepted by the Commission, is now being used by almost all the member countries.

Testing Form. A testing form for poplar timber was instituted in collaboration with the Chairman of the FAO Committee on Mechanical Wood Technology, and has recently been revised. It will facilitate comparison between industrial and laboratory tests and enable laboratory research to find application in actual production. It is thus hoped in the future to establish the mechanical properties of poplar woods according to their proposed use, and hence for poplar growers to be able to supply timber possessing the required properties. A permanent working group has been set up to deal with this subject.

Lists of Poplars grown in various Countries and their Exchange through National Commissions. Arrangements have been made for experts in different countries to exchange poplar cuttings and thus carry out experiments under varying conditions.

Poplar Diseases and Pests. Recommendations were made for studies to be carried out on certain diseases and pests, particularly on bacterial canker.

Culture Techniques. In the course of field trips, information was collected on the spacing to be used in poplar plantations, on the best fertilizers, on appropriate crops to be intermingled, on methods of propagation by cuttings, on pruning tools, etc. One of the main results of this exchange of ideas was that it was established that the optimum spacing for poplar plantations in Western Europe was to be 7m. by 7m.

Further studies are under way on variety control and cultivation methods. The results will be produced at the 1952 Commission meeting.

Future Activities

The International Poplar Commission plans in the future to devote more time to the subject of poplar utilization, and to this end has already suggested that delegations should include representatives of the wood-working industries. A permanent working group for the utilization of poplar wood is already functioning, and it is proposed to extend this activity by the creation of similar working parties within national commissions. The main objective is to put poplar growers in a position to supply poplar consuming industries manufacturing such products as plywood, veneers, matches, wood pulp, fiberboards, sawn wood and boxboards, with the necessary grades and quality of wood.

Up to the present the Commission has worked principally on poplars of the *Aigeiros* group, but in the future it would be extended to cover the *Leuce* group, which includes aspen and white poplars, the *Tacamahaca* group, including balsam poplars, and eventually the *Turanga* group, including certain Asian and North African poplars. These studies would be carried out on the basis of identification and cultivation, diseases and pests, and wood utilization. Their objective would be to identify types of *Populus nigra* and *Populus alba* which might be cultivated in relatively dry soils having an average or lower fertility, and to study poplars of the *Leuce* group which are capable of growing in closer stands than black poplars.

Near East Regional Meeting

A Near East regional meeting on Food and Agricultural Progress and Outlook was held at Bloudane, Syria, from 28 August to 6 September 1951.

The purpose of the meeting was to focus discussion on the broad aspects of the development of agricultural, forest, and fisheries resources in the Near East and their use to improve nutrition and living standards. This involves consideration particularly of policy objectives and programs. The importance of establishing sound forest policies and introducing effective legislation was stressed. The demarcation of forests and the compilation of inventories must be accompanied by steps to strengthen the administration. The meeting, the first regional gathering of foresters, suggested more intensive study of shifting cultivation and of measures to reduce the depredations of domestic animals and of charcoal burners.

Conference on Tropical Land Use

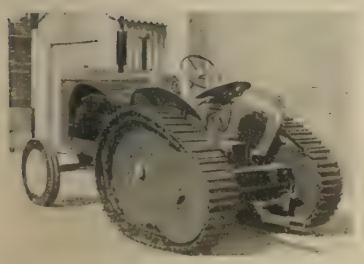
Today, the tropics are beginning to get the attention they deserve from the standpoint of improving production. Many of the underdeveloped countries are located in, or adjacent to, this belt, including some which have recently been going through profound social and economic changes. Many of the problems these countries face are necessarily dealt with in FAO's technical assistance project. Their people are eager to take advantage of the tide of modern scientific progress, and their governments need assistance in solving difficult new problems.

The 1949 session of the FAO Conference recommended a special meeting be convened to consider the question of land utilization in all tropical areas. When a conference with this geographical scope proved to be impracticable, it was arranged to hold a meeting on the narrower range of tropical land utilization problems in Asia and the Far East. This meeting was held in Nuwara Eliya 17-29 September, with the Government of Ceylon generously acting as host. The following countries were represented by experts familiar with tropical land use practices and problems: Australia, Belgium, Burma, Cambodia, Ceylon, France, India, Indonesia, Netherlands, Pakistan, Portugal, U.K., U.S.A., Viet-Nam; ECAFE and the Holy See also sent observers.

Among the questions considered were the problems of shifting cultivation; watersheds and irrigation, including the role of forests and methods of developing and conserving water resources; land classification systems adaptable to tropical areas; and the human aspects of land use, including land tenure.

Equipment News

The continual development of forestry utilization and woodworking industries is reflected in the increasing demand for information on new equipment. FAO's Forestry Division, on the recommendation of the FAO Conference, collects such information and sends it on request to member nations. There is also a regular feature UNASYLVA *dealing with new equipment, and the Forestry Division appreciates receiving data from manufacturers all over the world. Specifications should be accompanied by clear sharp photographs (glossy prints) of the equipment. FAO, however, can accept no obligation to publish all such information received.*



ROADLESS HALF TRACK — This equipment, which is interchangeable with wheels, is suitable for fitting to Allis Chalmers, Fordson Major and Massey Harris tractors. By using a specially shortened drawbar and an extra pair of brackets, it is unnecessary to remove either the idler mounting or the swinging drawbar when changing over to pneumatics. The steering, handling and speed of the tractor are unaffected by the changeover.

Roadless Traction Ltd. Hounslow (Middlesex), England.

LE TOURNEAU TOURNASKIDDER FOR USE WITH SUPER C TOURNADOZER

Tournaskidder : power control unit, Tournatorque electric motors and sheave gear boxes, and 2-sheave fair lead diameter $2\frac{1}{2}$ in.

Winch drum size : barrel diameter, 24 in. ; flange diameter, 32 in ; barrel length, 12 in. ; flange depth, 4 in. ; approx. cable capacity, 1,400 ft. of $\frac{1}{2}$ in.; 624 ft. of $\frac{3}{4}$ in. ; 460 ft. of $\frac{7}{8}$ in.; 360 ft. of 1 in. ; (type recommended 6×19 regular lay, filler wire, I.W.R.C. Tournarope, improved plow steel). Available line pull, full drum[1], 30,000 to 50,000 lb. ; available line speed (based on 2,000 engine r.p.m.), spooling (two-speed), low 75 ft./ min. high 150 ft./min. ; unspooling approx. 150 ft./ min.

Tournadozer : model: Super C ; engine (Diesel): GM – 6-71, 425. 6 cu. in. displacement 6 cylinders, 2-stroke cycle, max. brake h p 186 at 1,800 r p.m at sea level. Cummins H.R.B.-600, 743 cu. in. displacement, 4 cycle, 6 cylinders, max. brake 165 h.p. at 1,800 r.p.m. at sea level. Buda 6-DC-844, 844 cu. in. displacement 6 cylinders, max. brake 180 h.p. at 1,800 r.p.m. at sea level.

Speed in m p h. at 2,000 engine r p m : 1st gear forward, 1.61 ; 2nd gear forward, 3.69 ; 3rd gear forward, 8.38 ; 4th gear forward, 19.23; low reverse, 1.61 ; high reverse, 3.69.

Transmission : tournamatic, multiple disc clutches, air actuated ; steering : two wheels on each side controlled by air actuated disc clutches and brakes. Tires : 4 (21.00 × 25) 16 ; gauge: 8 ft. 2 in. ; wheelbase: 5 ft. 11 $\frac{5}{8}$ in. ; power control unit : Tournatorque electric motor and gear box ; line speed, Bare drum : 90 ft. per min.; line pull : 15,000 lb.

Over all measurements — With Tournaskidder — length, 17 ft., 2 in. ; width, 11 ft., 3 in. ; height (top of muffler),[2] 8 ft., 10 $\frac{3}{4}$ in. ; height (top of tournaskidder) 14 ft., 4 in.; ground clearance,[2] 21 in. ; drawbar, distance center line of hitch to ground,[2] 32 in. ; horizontal arc of travel, 140 in. ; cable requirements (type : 6 × 19 preformed, filler wire, *I.W.R.C.* Tournarope ; improved plow steel) ; dozer hoist cable, $\frac{1}{2}$ in. × 45 ft., approx. equipment weight, 37,230 lb., Tournaskidder, 5,530 lb., Tournadozer, 31,700 lb.

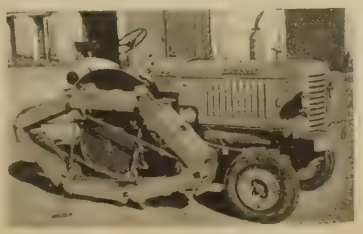
Optional Equipment : extra motors and drum assemblies for 2-line rear operation, angledozer, root rake, snow plow, tree pusher, E-16 carry-all scraper, side boom crane, cab (for use when Tournaskidder is demounted), cab heater, defroster, wind shield wiper, and horns available on order.

R. G. Le Tourneau Inc., Peoria, Illinois, U.S.A

[1] Depending on line speed used.
[2] At full rated tire deflection.

THE BLACKHAWK HALF-TRACK is designed for use with Ford and Ferguson tractors; is supplied in two widths 13 in. and 16 in. It can be used in logging operations, snow removal, grading, etc., and can be fitted with an idler assembly consisting of an axle and two small wheels which insure good steering and manoeuvrability.

Arps Corporation, New Holstein, Wisconsin, U.S.A.



ROTAPEDE RENAULT-DORIZON — The " Rotapede " is a device whereby the back wheels of a tractor may be replaced instantaneously in certain circumstances by special tracks suitable for heavy work. The skids are lowered in a continuous circle and move forward in close contact with the soil. Pressure on the soil amounts to 400 gr. per sq. cm ; drawbar pull, over 3 tons.

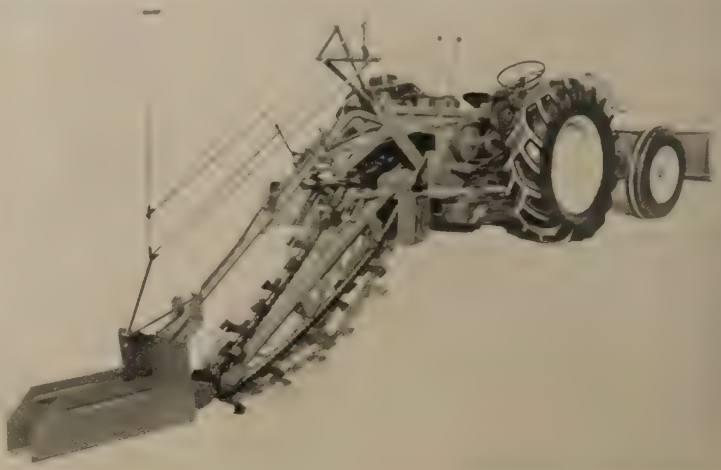
Régie nationale des usines Renault, Billancourt-Seine, France.

THE COOKE PATENT HEAVY DUTY 2-SPEED WINCH — In collaboration with Ford Motor Co., Ltd., and Roadless Tractor Ltd., this winch has been adapted for use with the Fordson Major for logging purposes. The winch can deal adequately with loads up to 10 tons. It has a large capacity drum for carrying 250 ft. of 5/8 in. wire rope. The average rope speed is 90 ft. per minute in high gear and 40 ft. per minute in low gear when the engine is running at 1,000 r.p.m. The anchor is detachable and can be raised or lowered by the operator while seated.

Charles Cooke Ltd., Mettham Street Works, Nottingham, England.

THE BLACKHAWK TRENCH HOG — The Trench Hog is designed for use only with Ford and Ferguson tractors. The machine is widely used for drainage tile ditching. It can be supplied with booms 3 1/2 ft., 5 1/2 ft. or 7 ft. in length for digging trenches to these depths. Two types of cutters are available for various trenching jobs, the standard or slicer type for ordinary soil conditions and the super service cutters for digging in extremely hard or rocky soil or frozen ground.

The former cutters are supplied in widths of 6 in. through 20 in. while the super service cutters are supplied in widths of 7 in. through 18 in. Some of the optional accessories available for the machine include the following : a special sprocket which affords more digging power when digging deep and wide trenches; a one-side delivery attachment for removing dirt from the trench to one side only ; a bulldozer blade for backfilling the trenches ; a crumber attachment for assuring a clean trench bottom.



Arps Corporation, New Holstein, Wisconsin, U.S.A.

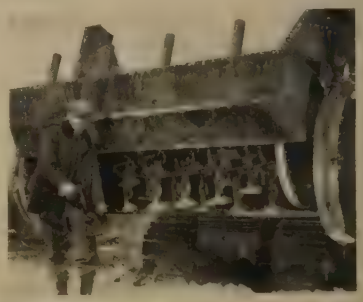
THE BUSHWACKER — The Bushwacker is a heavy duty machine for clearing land by removing brush, vines, undergrowth and trees. The carrier vehicle is a standard crawler-tractor modified to meet specifications. The base of the operating unit is a fabricated steel frame, rectangular in shape, which is mounted at the approximate longitudinal center of a heavy steel shaft through the frame of the tractor. The base pivots vertically upon the shaft. A Diesel engine mounted at the rear of the cab powers the operating unit which is mounted at the front end of the base.

The flails made of nickel-manganese steel castings are attached to the drum by 1 1/8 in. round links. The 20 flails are staggered on the drum to present a continuous cutting edge 72 in. wide. The gauge wheel which supports the front part of the machine moves in a vertical plane only and regulates the height of the cut. The operating principle of the Bushwacker is that under the impact of the rapidly moving flails the woody fibers of all growth are ruptured, the stalks or trunks broken and the whole reduced to mulch material which is deposited upon the cleared ground.

The flail heads are 6 1/2 in. wide, weigh 19 1/2 lb. and travel around the drum at a speed of 11,550 f.p.m.

The limiting factor on the Bushwacker performance is the tree diameter and practical ranges are from 5 in. to 6 in. for hardwoods from 5 in. to 8 in. for softer woods.

Rate of production varies with operating conditions. Where growth is heavy to medium the tractor moves in low gear at a forward speed of 1 1/2 m.p.h. At this rate the machine will clear an acre in one hour of continuous operation.



Distributors : Willis S. Martin Co. Lincoln National Bank Building, Fort Wayne 2, Indiana, U.S.A.

BRUSH CONTRACTOR — This brush cutter is suitable for cutting heavy (3 to 4 in. in diameter) and thin brush alike. The saw itself is tiltable in any direction since the tubing fits in a loose socket at one end; it can sweep in front of the operator at the flexible joint covered by the operator's hand. The shorter tubing is swiveled near the engine and allows cutting overhead within the reach of the whole tubing length. The 1 h.p. engine handles all general brush cutting; a 2 1/2 h.p. is also available. The difference in weight is only 4 lb.

Industrial Development Shop, Acton Street, Nashua, N.H., U.S.A.

P.P.K. EARTH DRILL — The earth drill P.P.K. is a type of [illegible] it is mounted on a mot[illegible] places the cutter bar [illegible] feature of the mechanical saw [illegible] earth drill consists of an Archimedes screw mounted on a spindle of adjustable height. The instrument can drill holes of from 30 to 50cm. in diameter and of a depth of up to 1m. The shape of the holes is strictly cylindrical.

Etablissements P. P. K. 45-47 Boulevard St., Denis, Courbevoie-Seine, France.

ROTAVATOR — The Rotavator is attached as an integral part of the tractor and is rotor driven from the power take-off. The rotating action of the blades, which revolve in the same direction as the land wheels, creates a forward thrust and actually assists the whole unit forward. A screw adjusted depth wheel controls the working depth of the blades up to a depth of 10 in.

The framework of the Rotavator is entirely constructed of fabricated steel and steel castings. Two speeds are provided for the rotor, but a further range of gearing can be obtained by changing the sprocket on the intermediate shaft. Alternate rotor widths of 7ft. or 8ft. are available. Heavy duty blades can be supplied for land clearing and cutting undergrowth in the forest.

Rotary Hoes of England, Station Road, East Horndon, Essex, England.

PACK TRACTOR.—This small tractor can be transported as a complete unit by air; it is controlled by the operator walking behind. *Specification:* over-all dimensions, length, 78 in.; width, 30 in.; height, 36 in.; weight, 650 lb; wheel base, 43 1/2 in.; ground clearance, 6 in.; pay load, 600 lbs.; engine, 6 h.p. 4 cycle air-cooled single cylinder.

Main clutch and transmission: automatic 4 : 1 ratio; drive, main reduction 15; 1 worm; multiple disc steering clutches mechanical steering brakes final drive gear ratio 5 : 1; frame, welded tubular steel; load compartment, welded sheet steel; 14 cu. ft. capacity; track and bogies, link belt chain and standard sprockets for drive and idlers. Vehicle track: rubber with rubber and plastic cleats; track driven with circular section of vee belt.

Department of Lands and Forests, Ontario, Canada.

Loggers' Dream Model LRW Combination Skidder (Yarder) and Loader — It is mounted on military white track skids or yards; can log up to 10 tons in weight over a distance of 1,200 ft.; operates over a radius of 180° from any fixed position.

Loads logs up to 7 tons without tie-down and larger logs of 10 tons and more with tie-down cables. When truck or half-truck is mounted the "loggers' dream" hauls itself at highway speeds, or it may be mounted on wheel or track trailers, skids, boat, barges to suit local conditions. Requires only a 3 man crew for complete operations of yarding and loading. There are six standard "loggers' dream" models designed to yard and load logs of different sizes on different types of terrain.

Taylor Machine Works, Export Division 101, *International Trade Mast, New Orleans*, 12, *Louisiana, U.S.A.*

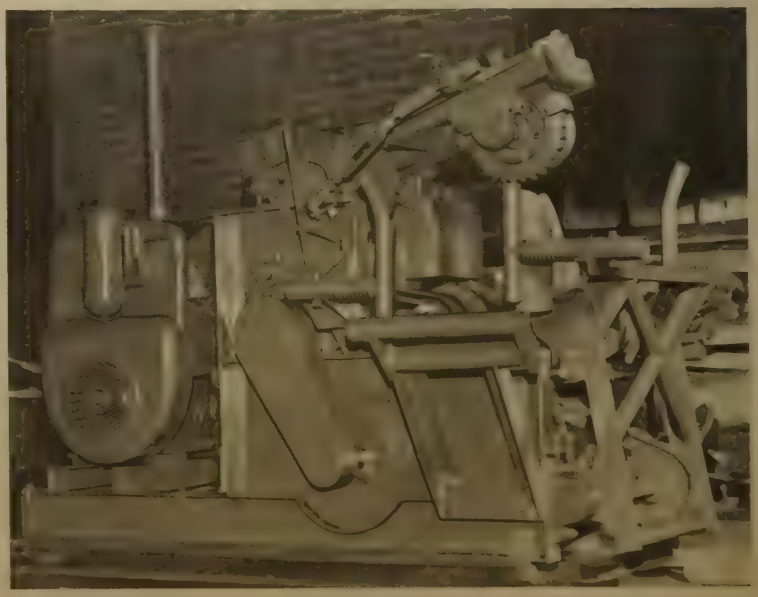
Sandy Hill Peppy Peeler
This is a portable peeler of the knife type with adjustable knives capable of handling wood from 3 in. to 20 in. in diameter; requires approximately 20 h.p. and has a capacity of 2 to 3 cords per hour. The peeler together with its prime mover, weighs approximately 2,200 lb. It may be driven by means of an electric motor for permanent installation, or by means of a gasoline engine when being used in the woods.

The Sandy Hill Iron and Brass Works, Hudson Falls, N.Y., U.S.A.

Do-all Super Zephyr — The Do-all band saw, manufactured of pressed steel-sheet, has the advantage both of rapidity and lightness. Its construction is simple from the point of view of adjustment and maintenance and its protective device reduces the risk of accidents to a minimum. Speed: 500 r.p.m. with motor of 1 h.p; 15,000 r.p.m. with motor of 15 h.p.

Specifications: height, 8 ft. 7½ in.; diameter of wheels, 36 in.; angle at which table may be tilted, 45° to the right; 5° to the left; height of table above ground, 41 cm.; max. length of blade, 240 in. on 20 in.; width of blade, 1/8 in. to 1¼ in.; weight without motor: at fixed speed, 1,690 lb.; at variable speed, 1,950 lb.

The Do-all Co., Des Plaines, Illinois, U.S.A.



Sundstrand Single Pad Air Sanders — *Specifications :* weight 5 1/2 lb. ; length of stroke 3/16 in. ; paper capacity of clips: 4 to 8 sheets; paper refill time: seconds; speed: 1,500 to over 3,000 oscillations per minute ; air pressure required : 50 to 100 lb.

Sundstrand Machine Tool Co., Pneumatic Division, Rockford, Illinois, U.S.A.

Metalclad Vertical Boring Machine Type "DA" — *Features :* sliding motion of head operated by either foot or hand lever acting independently of each other ; boring head spring loaded ; conveniently placed controls ; totally enclosed raising gears for table ; rapidly adjustable fence ; adjustable stop for governing depth of holes.

Specifications : boring chuck capacity, 0 to 1/2 in.; motor, 2 h.p.; approx. speed of motor, load speed), 2,850 r.p.m. ; vertical adjustment of head, 6 in. ; max. distance between chuck and table, 24 in. ; size of table, 16 in. ; will bore in center of material up to a width of 28 in. ; floor space, 24 in. - 39 1/2 in.

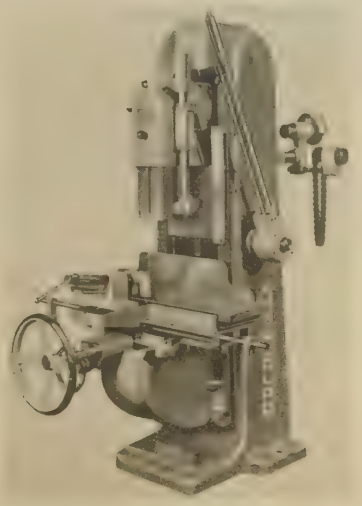
Comet Radial Saw Generator Combination — *Specifications :* Comet Clipper, 3 h.p. 3 phase ; saw, 16 in. × 1 in. eye ; guard, 16 in. cast aluminum ; capacity, 4 3/8 in. deep ; standard arm, 16 in. width cut-off, 22 in. width of rip.

Generator : Pioneer Special. Capacity, 5 kw. ; voltage : 3 phase, 240. . phase, 120 ; 60 cycle at 1,800 r.p.m.; voltage regulation : automatic ; battery charging, rectifier 6 volts.

Engine : Hercules Model ZXB ; cylinders: 4 automotive type ; cooling: radiator, pump and fan ; starting: Bendix, 6 volt battery ; governor: automatic; speed: 800 direct connected ; ignition : magneto ; lubrication oil pump ; equipment : air cleaner, oil filter, radio shielded plug.

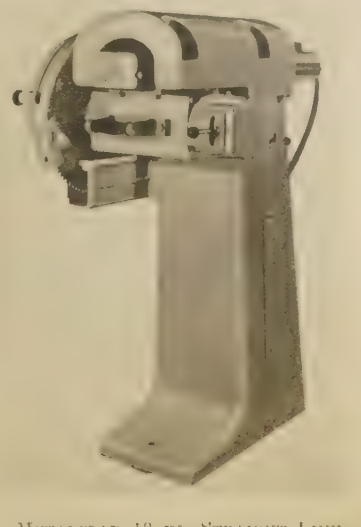
Trailer: special 2 wheel. Wheels: Timken bearing, auto tires 5.50 - 16 pneumatic ; tow bar ; safety ball hitch, adjustable leg, safety chain ; springs, cantilever. Net weight : 1 600 lb.; shipping weight : 1.700 lb.

Consolidated Machinery and Supply Co. Ltd., 2029-33, *Santa Fé Avenue, Los Angeles, California, U.S.A.*



Metalclad Chain Cutter and Hollow Chisel Mortisingmachine — Quick change-over from chain to chisel mortiser. Smooth movement of chain or chisel head with conveniently placed ratchet hand lever adjustable to suit any type of work. Totally enclosed dust-proof gears for table movements. Table may be swung away for door lock mortising. Rapid clamping of work to table by means of strong saw adjusted cramp pad. Adjustable steps on table front give constant length of mortise when on production work. Adjustable limit switch automatically stops the machine when chain or chisel is brought clear of the work.

Specifications : will take tinker up to 11in. x 9in. ; max. size of mortise-using chain, 1 1/4 in. x 3 in. x 6 in.; max. size of chisel for hard wood, 5/8 in. ; max. size of chisel for soft wood, 7/8 in. ; will bore up to 1 in. ; max. depth of mortise, 6 in. ; size of table, 27in. x 8 in.; max. longitudinal movement of table, 24 in. ; max. transverse movement of table, 4 1/2; height of table from floor, 24 1/2; motor : 4 h.p. ; speed of motor (3 phase, AC type only), 3,000 r.p.m. ; floor space with max. movements, 72 in. x 44 in.



Metalclad 18 in. Straight Line Crosscut Saw — Rigid frame with large foot area for stability. Saw carriage runs on ball-bearing runners. Spring loaded return to saw carriage. Rotor and stator fan-cooled. Single lever control for electrical start-stop and mechanical brake. Saw guard and dust chute hinged for convenience in changing saws.

Specifications : max. diameter of saw, 18 in. ; will cut off, 14 in. × 5 in.; motor : 4 h.p. ; speed of motor : 2,850 r.p.m.; diameter of saw spindle, 1 1/4 in., height from floor to table, 31 in. ; Floor space (max. movement without tables) 2 ft. 2 in. × 5 ft. 6 in.

"Metalclad" machines all manufactured by George Cohen, Sons and Co. Ltd., Cunards Works, Chase Road, London, N.W. 10, England.

Moisture Detector Delmhorst Model RC.I. — The new model RC.I. moisture detector measures moisture content of all kinds of wood over a range of 6% to 65% ; it is extremely simple to use as the moisture content is read directly on the dial without any additional operations after making the initial adjustment to check the batteries. It is small and compact and only weighs 8 1/2 lb. complete with all accessories. The 4 pin electrode for testing lumber 1/4 in. and greater in thickness is the standard equipment with model RC.I. Other electrodes are available for testing veneers or for measuring moisture gradient.

Delmhorst Instrument Co., Boonton, New Jersey, U.S.A.

Polishing and Finishing Machine — This heavy duty centerless polishing and finishing machine is designed and built to operate under continuous production loads. Will handle cylindrical work up to 1 1/2 in. diameter of limited weight either straight or tapered. Work may be fed to the machine either manually or by means of hoppers or other automatic feeding devices suitable for individual application: capacity subject to weight : 1/16 in. to 1 1/2 in. diameter ; belt length : 4 in. × 84 in. ; belt speed, 5,000 s.f.m. ; drive : Uni-Pull belt ; motor : 3 h.p , 1,800 r.p.m. ; floor space : 33 in. × 40 in. ; over-all height : 59 in. ; net weight with motor, 1,050 ; shipping weight with motor, 1,260.

Production Machine Co., Greenfield, Massachusets, U.S.A.

Telescopic Fork Lift Truck Manufactured in Four Model. — All models powered by 6 cyl. Chrysler industrial engine, 65 b.h.p. at 1,800 r.p.m. ; speeds, with or without load, 12.5 m.p h. Yard King 40 : 4,000 lb. capacity-telescopic lift of 124 in ; weight 7,525 lb. ; lift : no load 40 ft. per min. full load 40 ft. per min.

Yard King 60 : 6,000 lb. capacity-telescopic lift of 124 in. ; weight 9,300 lb. ; lift, no load 40 ft. per min. ; full load, 38 ft. per min.

Yard King 70 : 7,000 lb. capacity ; telescopic lift of 118 in. ; weight: 10,000 lb. ; lift : no load 37 ft. per min., full load 33 ft. per min.

Yard King 80 : 800 lb. capacity ; telescopic lift of 118 in., weight : 11,000 lb. ; lift : no load 37 feet per min., full load 30 feet per min.

The Yale and Towne Manufacturing Co., Philadelphia Division, Philadelphia 15, Pa., U.S.A.

Pull-Pac for Car-loader Model Fork-Lift Trucks — The Pull-Pac handle material without the use of pallets. The Pull-Pac is a combination push-and-pull attachment for Clark gas and electric car-loader model fork trucks. It consists of three basic parts : (*a*) load carrying plate ; (*b*) pusher rock and (*c*) gripper jaw.

Clark Equipment Co , Battle Creek, Michigan, U.S.A.

News of the World

The items appearing here are condensed selections of news thought to be of interest to readers of UNASYLVA. *They are grouped alphabetically by countries under headings currently used by the Forestry Division for reference purposes. The Editor will be glad to receive direct from readers authenticated items of interest and of news value for this part of the review.*

General

CANADA

• National Forest Conservation Week was observed in Canada for the first time this year, 19-26 May. Last year, four Canadian provinces — Newfoundland, New Brunswick, Quebec and British Columbia — held forestry weeks at different dates and under different names, (the Quebec week was known as "La Semaine de l'arbre"), which were highly successful in calling public attention to some basic forestry facts. This year, by the combined participation of all provinces at the same time under the one name "Forest Conservation Week," it was believed that Canadians would be more firmly convinced than ever of the economic, strategic, aesthetic and basic importance of forests.

COSTA RICA

• It is proposed to establish a natural reserve park in Costa Rica, adjacent to the Pan-American Highway. A site has been selected where, within a relatively small area, there exist three distinct ecological associations, each with a multitude of species. These are: (1) the giant oak forest, (2) a mixed broadleaf forest, (3) the bogs and swamps where the cycad-like ferns, *Lomaria* and *Puya*, occur, far from their natural habitat in the South American Andes.

It is to be hoped the Government will also protect and develop the rest of the natural forest traversed by the Highway. If opened to uncontrolled cutting, the timber resources will quickly be destroyed.

EIRE

• The Minister for Lands has completed negotiations for the purchase of the Shelton Abbey Estate, Arklow, and all of its buildings, land and timber. It is intended to utilize the Abbey for forestry education and research and ancillary objects; to preserve and cultivate the growing timber and to plant and develop the lands in accordance with good forestry practice. About 1,000 acres (405 ha.) of land and timber go with the Abbey. The timber, of which the main crop is oak, is of exceptionally good quality, and its preservation and cultivation will ensure continuance of a particularly good strain of oak trees. The gardens and shrubs are also of great interest, and the rhododendrons especially are of rare quality.

FINLAND

• With funds granted by a forest industries company, courses in bookkeeping, cost calculation, English and English correspondence have been arranged for forestry undergraduates at the University of Helsinki. Forest industries have also presented funds to undergraduates for a course on floating timber. Other types of training and similar activities have also been energetically undertaken.

In order to raise the skill of forest owners, a forestry school was started in central Finland in 1950 and several courses, chiefly on silviculture and logging, have been arranged by the Central Forestry Association "Tapio." The League of Finnish Foresters also arranged refresher courses on logging, forest mensuration and silviculture. Two courses on leadership were included.

The Forest Service has arranged various long and short refresher courses for its subordinate forest experts. In addition, there was a four weeks' forestry course for men teaching in elementary schools, and a five weeks' forestry course for boys in the continuation classes of elementary schools. Both courses, arranged by the Forest Service, were the first of their kind in Finland. The Forest Work Studies Section of the Central Association of Finnish Woodworking Industries, "Metsäteho," has provided courses, chiefly technical, for the personnel of its member associations. During the courses the participants become familiar with caterpillar and wheel tractors suitable for the transportation of timber, loading apparatus, motor-saws for the felling of trees, and the resistance and suitability of steel cables.

HAWAII

• During the last five years more than 100 different species have been planted in Hawaii's forest reserves, so that the island one day may boast the most diversified collection of timber types in the world. These include no less than 15 varieties of Eucalyptus from Australia. The Pacific Coast of North America is represented by such items as Monterey pine (*Pinus radiata*), Douglas fir (*Pseudotsuga taxifolia*), California Redwood (*Sequoia sempervirens*), Port Orford Cedar (*Chamaecyparis lawsoniana*), Western Red Cedar (*Thuja plicata*). The American South has contributed loblolly (*Pinus taeda*) and slash pines (*Pinus caribaea*). There is sugi from Japan; camphor from the East Indies; roble from Chile; teak from India and balsa from Ecuador. Other items include narra from the Philippines; English and black walnuts (*Juglans regia* & *Juglans nigra*), cork oak (*Quercus suber*), and a host of other species, not overlooking members of the true mahogany family and Spanish cedar.

TURKEY

• The first issue of a new annual forestry review, "La Revue de la faculté des sciences forestières de l'Université d'Istanbul," has been published by the Forestry Faculty of the University of Istanbul. A large part of the first issue is devoted to the organization of the Faculty which, although established as long ago as 1857 for the purpose of supplying trained foresters to the State Forestry Department, was only affiliated to the University in 1948. The Faculty is situated in Bahçeköy on the shores of the Bosphorus and close to the Belgrad forest which covers an area of about 12,500 acres (5,059 ha.) and is used for practical forestry training and experiments. The Faculty buildings, which consist of lecture rooms, a library, a forestry museum, laboratories, a meteorological observatory, students quarters, etc., are surrounded by a park and plantations of indigenous species and various exotics. A forestry nursery covering 40 acres (16 ha.) and a botanical

garden of 80 acres (32 ha.) are under construction.

New students enter the Faculty at about the rate of 40 to 50 a year. A certain number receive state grants for their training, in return for which they are required to serve with the state Forestry Department at least eight years. The first two terms are spent at the University in Istanbul, where the curriculum includes mathematics and natural history; the remaining six terms, spent at Bahçeköy, are devoted to Forest Botany, Forest Ecology and Pedology, Forest Entomology and Protection, Silviculture and Afforestation, Forest Engineering, Surveying, Erosion Control, Forest Utilization, National Economy, Forest Finance and Forest Laws, Forest Economics and Mensuration, Forest Management, Forest Geography and World Forestry and Steppeland Conservation. In addition, courses in English, French and German are compulsory for the first four terms. Practical training accompanies all the theoretical work, and during vacations between the fifth and seventh terms students work with one of the state Forest Divisions.

The Forestry Faculty is composed of eight Chairs and eight Research Institutes; chairholders are simultaneously directors of the corresponding institute. A new Chair and Institute of "Forest Geography and Forest Conditions in the Near East" was created in March this year. In addition, it has recently been decided to set up a Central Forest Experiment Station as an autonomous institute affiliated with the Forestry Faculty, which is the only one of its kind having both the material equipment and the personnel to undertake systematic research work. Funds for this Experiment Station will be supplied by the state Forest Department.

A further development this year was the establishment of a Publications Unit to produce textbooks, for spreading information to the public on forest utilization and necessity of forest conservation, and for the periodical publication of the results of research work. The remainder of this first issue of the review, which contains German and English summaries of the articles, falls within this last field of activity, the reporting of research and the analyzing of the particular forestry problems with which Turkey, in common with other countries of the Near East, is faced today.

United States of America

• The Conservation Foundation of New York City, N.Y., U.S.A., is a private, non-profit-making, non-partisan, chartered organization, set up to promote conservation of natural resources — animal life, forests and other plant life, water resources and productive soils — and to advance, improve and encourage knowledge and understanding of such resources, their natural distribution and wise utilization, and their essential relationship to each other and to human welfare. The Foundation is supported by gifts from institutions, foundations, business organizations and individuals. There is a technical staff of eight men, together with a comptroller and office manager and four associates, each dealing with a specific project, and a technical advisory council of twelve from the United States, England, Scotland, and Belgium who choose projects and lay down lines of work. Very careful prior investigation of all work proposed is made from the standpoint of need, importance, sources of support and co-operation, and of overlapping with work already under way elsewhere.

The Foundation is concerned with conservation education, both in the field of higher education and at lower educational levels, including the instruction of non-technicians. Among specific activities are the support of the newly established graduate course in conservation at Yale University; study of conservation laws and their administration in the state of Pennsylvania; a seminar at Harvard on the economics of land use; a conservation workshop for urban school teachers in New York; and the holding of a conservation seminar in California. In addition, the Foundation has completed and distributed throughout the country a series of films on soil, forests, and ecology, and is preparing another series on water resources. In addition, film strips are being prepared, with sound tracks for all films in Spanish and Portuguese, so that they may be used in Central and S. America. The work of the Foundation is developing steadily and productively, covering new fields and projects, and its publications, such as "Water in Industry," are sound and well produced.

The growing attention paid to conservation teaching in American schools is illustrated by the fact that the 1950 Yearbook of the American Association of School Administrators devotes its 527 pages to conservation education, covering the principles and philosophy of resource use, educational materials, practices and programs, and the training of teachers.

• In 1950, the U.S. Forest Service approved some 21 technical assistance projects covering various phases of forestry and the production of forest products, of which sixteen, involving the participation of individual countries, were initiated by ECA. One-half of these projects were completed in 1950, and the rest are scheduled for completion in 1951. Six of the ECA technical assistance projects involved sending from one to five delegates from 15 different countries to the United States; two required the services of American experts abroad.

Five of the 21 approved projects, involving the participation of groups of countries, were initiated by the Organization for European Economic Co-operation and completed in 1950. On four of these projects, international delegations of experts, ranging from 6 to 51 members, came to the United States to study American methods, and on the fifth project, an American expert made a study of chestnut blight for some of the OEEC member countries.

In the United States, one group of 51 European delegates and another of 40 delegates from tropical countries, under the auspices of the Forest Service, studied the pulp and paper industry; native and hybrid poplars; forestry, forest exploitation and transport; sawmill organization and techniques, plywood and wallboard industries, and the conditioning and marketing of timber. Other technical assistance projects in which the Forest Service participated included training a number of foreigners — 5 from Germany, 2 from Italy, 2 from Austria, and one each from other European countries. Five Turkish foresters arrived in the United States for a year's special training in different branches of forestry work. Similar one-year study awards were made to one forester each from Indonesia and Honduras. In addition, five Japanese foresters sent by the Supreme Command in Tokyo, were given forestry training during the year. Two Forest Service employees went on short advisory missions to Japan, another to Chile, and one to Okinawa.

• As the reports of the annual meetings of the Society of American Foresters reflect the wide range of interests and occupations of its members, so the transactions of U.S. Wildlife Conferences depict an equally broad scope. Foresters and wildlife workers alike receive technical papers dealing with forest, range and watershed in relation to wildlife and vice versa. By this means the interrelation of these resources is recognized and documented, leading to the conclusion that their conservation should be treated as a single entity. Both meetings are attended by many non-technical men who deal with forests and wildlife as landowners, as state officials, as educators and as publicists, with the advantage of bringing together the technicians and laymen concerned to the benefit of both and to the benefit of forestry and wildlife management.

Both meetings have general and technical sessions owing to the diversity of their fields. In the case of the Wildlife Conference, one general session was devoted to a symposium on conservation education, emphasizing the wildlife aspect, while at the same time recognizing it as part of the whole. Another session dealt with land and water policies, considering valley development plans, the engineering aspect of land and water conservation, the case for a federal department of conservation, the importance of stockmen in land

and big game management, and watershed management as the key to resource conservation. Some of the technical sessions are naturally of secondary interest to foresters — disease, nutrition and control problems; wet-land and fresh-water resources; coastal and marine resources. But even in these sessions such questions as the relation of forest range conditions to whitetail deer fertility and the effect of forest habitat on the management of the pine marten — a fur-bearer — receive attention. In other technical sessions, dealing with small-game resources, research and management, and big-game resources, a number of papers describe the relations between range conditions and land utilization and the status of small and large game species. A new technique — movable paddocks — for studying comparative and competitive food habits of deer and livestock on forest range is reported.

Silviculture

Australia

• The first plantations in the state of South Australia were made in 1876, and now cover an area of 105,698 acres (42,800 ha.) the greater part of which, consisting of 71,500 acres (29,000 ha.), is to be found in the south-east — the only part of the state where the annual rainfall exceeds 25 in. (635 mm.) and where it is evenly distributed over the year. An important physiographic feature of the region is the formation of ridges or hills composed of secondary limestone and calcareous cemented sand covered with a layer of aeolian sand; the plains between these ranges have a sub-soil of Miocene limestone of the coraline type. Soils of volcanic origin are also to be found, mainly limited areas of basalt, which are chiefly used for intensive agriculture or for dairy farming. The original vegetation, which is of little value, includes a sclerophyll forest on the hills and savannah, interspersed with heathland and swamp on the plains.

Pinus radiata accounts for 90 percent of the plantations in the south-east, and *P. pinaster, muricata, canariensis, halepensis, laricio, taeda* and *caribaea* account for 10 percent, of which *P. pinaster* seems to be the most promising species. The present policy is to complete plantings already begun with *Pinus radiata*, which now covers 65,000 acres (26,000 ha.) and which will ultimately be extended to cover approximately 90,000 acres (36,000 ha.) by making regular plantings of 2,500 acres (1,000 ha.). However, for various reasons, the age class distribution is at present very irregular; only 500 acres (202 ha.) are planted with trees of over 30 years, 19,000 acres (8,000 ha.) of trees from 20 to 30 years, 30,000 acres (12,000 ha.) of trees from 10 to 20 years and 15,500 acres (6,000 ha.) of less than 10 years. Under these conditions, total forest stands are still far from achieving their ultimate goal — a yield of 300,000,000 super ft. (1,359,000 m³) of 4-inch (10 cm.) thickness and above, on a total area of 110,000 acres (45,000 ha.), assuming a final 40-year rotation — which was based on present thinning practice and on the anticipated yield of stands which have not yet reached the normal age of exploitation. Plantations which were subjected to early cutting are chiefly those which were planted in the depression years (when labor was plentiful but planting stock insufficient) with wide espacements of up to (10.8 ft. × 7.9 ft. (3.3 m. × 2.4 m.); these stands are usually low-branched and of poor quality. Stands are now planted with a uniform espacement of 6.9 ft. × 6.9 ft. (2.1 m. × 2.1 m.). The classification of forests into categories of site qualities, and the compilation of tables of the annual average increment for unthinned plots is now complete and is to be followed by the preparation of similar tables for thinned plots. This research has made possible the detailed grading of wood and estimating of the requirements of pulp factories and sawmills.

It is recognized that the practice of early thinning (at the age of five or six years) is undesirable. It is estimated at present on the basis of the research that has been carried out, that first thinnings should be made between the ages of 12 and 17 years, depending on the site quality, and that they should leave the stand with from 350 to 400 stems per acre (875 to 1,000 per hectare). Yields from such thinnings range from 12,000 to 20,000 super ft. per acre (134 m³ to 224 m³ per hectare). A second thinning made five to eight years after the first should leave 250 to 300 trees per acre (625 to 750 per hectare), and a third thinning, made after a similar interval should leave 125 to 200 per acre (310 to 510 per hectare). All logging for state sawmills is carried out either by contract or piece work and is facilitated by the system of laying down roads when the stands are established. Felling is done both by hand and power saws. The so-called "Crane" truck has been especially developed by the Forest Service to enable completely mechanical loading, except in the case of very short logs.

Canada

• Experiments in strip thinning of overstocked stands of Jack pine (*Pinus banksiana*) and spruce (*Picea*) in Saskatchewan, have recently been conducted using a tractor winch to uproot trees in 10, 15 and 20 foot strips (3.0 m., 4.6 m., 6.0 m.) Since the cost of hand thinning is very high in these dense stands, the cost, in terms of manhours, is very much less with machine methods. Plots have been established to study the growth and survival under hand and tractor methods of thinning.

• Forest lands in the interior of British Columbia have been grazed by domestic livestock for over half a century, providing summer range to supplement the spring-autumn range of the natural grasslands, but until recently there has been little study of the forest ranges and their problems. In 1935, however, a range experimental station was established and information on ranges and their problems is now available.

The ponderosa pine zone is generally limited in extent, the timber is open and forage is similar to that of the adjacent grasslands. The Douglas fir (*Pseudotsuga taxifolia*) type is most important from the grazing standpoint. Large areas have been converted to lodgepole pine (*Pinus contorta* var. *latifolia*) by fire, and a great deal of aspen (*Populus tremuloides*) has come in. Grazing in this type of range from about mid-June to the end of September produces satisfactory weight gains of animals, but earlier or later use is unprofitable and is damaging to the range. The spruce-fir zone of the higher altitudes has grazing value principally on the numerous natural meadows, on the more open stands near the timber line, and on burned-over areas. The forest lands possess other values for timber production, watershed protection, recreation and wildlife, and grazing use must be fitted into this multiple use pattern. From studies to date, it seems evident that, with proper control of stock and management of stock on the range, grazing can be maintained without damage to the other values.

United States of America

• Red pine (*Pinus resinosa*) is widely used in forest plantations in the Lake States and north-eastern states because of its desirable qualities as a tree and the wide range of uses for which the wood is suitable. A recent investigation of the relation between the mechanical properties of the species and the factors which influence them involved determination of values for modulus of rupture, fiber stress at proportional limit, modulus of elasticity, maximum crushing strength, and toughness. All these values were found to be materially lower than those of old-growth trees, due to the rapid rate of early growth of the plantation trees. It is thus evident that, to attain highest strength values, red pine stands should be established as densely as practicable and, after crowns have closed, the thinning program should maintain growth at about 12 rings per inch.

• A recent study on the role of fire as an ecological factor in the ponderosa pine forests of the south-western United States has analyzed records of fires in the past by dating fire scars through making a count of tree rings. It was found that the

average periodicity of fires in the days before white occupation varied from 5 to 12 years, averaging about the same as the periodicity of earlier fires determined in the Californian pine forests. Thus, recurring fire had a profound effect on developing the type of forest which the white man found, and he in turn, through his often extensive use of fire, continued its importance as an ecological factor. It is evident that, while fire may be used under full control for reduction of hazards and, in some cases, to improve forest growth, the information on its use is far from complete and much further work is still required.

• In western Colorado, there are at least one million acres of depleted sagebrush rangeland on which reseeding is desirable, since it can increase several times the amount of grass now produced. The lands are partly in the lower zone [4,500 - 6,000 feet (1,370 to 1,830 m.) elevation] with 8-11 inches (203 to 279 mm.) annual precipitation, partly in the middle zone [6-8,000 feet (1,830 to 2,440 m.) elevation] with 11-17 inches (279 to 432 mm.) precipitation, and partly in the upper zone [8-10,000 feet (2,440 to 3,050 m.) elevation] with over 18 inches (457 mm.) precipitation. For each of these zones from one to six grass species can be definitely recommended as capable of increasing grass yields from 3 to 15 times above the present rate. Certain general rules for reseeding have been worked out as a result of research and experience to date: (1) select the most productive sites; (2) choose areas where forage or soil protection is needed and where the stand of natural grass is so thin that reseeding from it is unlikely; (3) kill competing vegetation; fire can sometimes be used, particularly in the middle zone, and is the cheapest method, but must be used only when proper advance preparation is made; some of the special plows not only kill competing vegetation but prepare a good seedbed; (4) seeding is best done by drilling to depths suitable for the grass species used; (5) the species which promises the greatest returns for the zone and site should be used; (6) seeding should be done at a time when rain will ensure establishment of the plants; this is usually in the very early spring or late autumn; (7) the seeded areas must be protected against use until they can withstand grazing – usually during the summer or autumn of the second or third growing season; (8) the management of grazing on reseeded areas must avoid damaging practices.

Logging and Engineering

United States of America

• In logging the heavy stands of the Douglas fir (*Pseudotsuga taxifolia*) region in the Pacific North-west of the United States, the prevailing practice is to clear cut by staggered settings. This system is preferred because the uncut stands serve to some degree as firebreaks for the clear-cut areas and provide abundant sources of seed. The effectiveness of this practice depends very largely on planning roads carefully, in setting the precise boundaries of the areas to be cut so that the erosion caused on roads and other forms of damage may be held to a minimum. The initial job of planning can be done on maps (both topographic and stand maps are now generally available), but field work to check the location of roads and settings is still essential. A recent study of five selected areas by the Pacific North-west Forest and Range Experiment Station showed that the cost of this detailed field work is relatively insignificant, since it amounts to about 11 cents per M.B.M. of the volume initially cut, from 2 to 4 cents per M.B.M. for the volume served by the plan, and in most cases, from $1.10 to $1.50 per acre. Obviously these small costs are far more than repaid by the damage avoided and, no doubt, by economies in logging.

Yugoslavia

• It is reported that modern mechanized logging has been introduced successfully into the rugged mountain forests of Yugoslavia through the development of a new mobile trackline logging donkey mounted on caterpillar tracks. First units of the new equipment have been put into operation by the Yugoslav Government with an American field engineer training the operators. The new mobile machines and newly perfected openside carriage are being successfully employed to move large turns of logs over rough ground badly cut up by deep narrow canyons. The self-propelled units and self-locking openside carriage were developed for the particular requirements of Yugoslav forest conditions. In developing this type of equipment the manufacturers also had in mind the various requirements throughout the world and will produce the mobile trackline in sizes and with drum arrangements and accessories to fit any type of logging.

Forest Injuries and Protection

Australia

• The relations of meteorological conditions to bush and grass fires in Australia have long been recognized, but it was not until 1935 that the first fire weather station was set up in Western Australia. Since that time, the number of stations has greatly increased and much research has been done on the specific relations between weather and fire, the methods of measuring and classifying current fire danger, and forecasting impending degrees of danger for short periods. While long range forecasting work is carried out in Australia as elsewhere, no sufficiently accurate method has yet been found for it to be of value to fire control organizations. In their own respective fields, the meteorologists and foresters of Australia have had the advantage of the pioneering work done in the same fields in Canada and the United States. In 1947, the results of Australian work up to that time were collected and analyzed. Particular emphasis was placed on the relationship of fire hazard to weather conditions prevailing before the danger period. It was demonstrated, for example, that the rainfall during the three months preceding fires is a critical factor; from such data, it is possible to prepare a provisional index of the severity of the approaching fire season. However, within the fire season, in Australia as elsewhere, it is short-term fluctuations of weather which are often of the greatest importance in determining the fire danger of particular days or periods. Wind direction is important, largely because different winds have different characteristic atmospheric humidty, and the relation of humidity to fire danger is well known. Wind velocity is also of extreme importance in determining the rate of spread and fire damage.

The work has progressed so far that the meteorological conditions conducive to the spread of fires have been fairly accurately established for each state of the Commonwealth and a system of "fire weather" warnings has been set up for each state. The warnings are distributed by broadcasts, by telegrams to fire control organizations, and by the press. Various agencies, as well as the Forestry Department, are co-operating in the collection of weather data and determination of current fire dangers, while the Commonwealth Bureau of Meteorology is giving serious attention to the problems of forecasting.

United States of America

• The Forest Pest Control Act of 1947 (Public Law 110) established a broad governmental policy for the protection of forest resources from insect pests and plant diseases, including surveys to detect and appraise infestations and authorization to carry out, independently or co-operatively, programs to suppress, control, or eradicate such pests. Funds to carry out this authorization became available on 1 July 1949. Work under this act during the past year involved two of the most ambitious control projects ever undertaken. These were: 1) the spraying, by aeroplane, of more than 900,000 acres (364,230 ha.) of Douglas fir (*Pseudotsuga taxifolia*) and white fir (*Abies concolor*) forests in Oregon and Washington to control the spruce budworm (*Choristo-*

oneura fumiferana) and (2) the chemical treatment of nearly 800,000 Engelmann spruce (*Picea engelmanni*) trees to kill active broods and prevent further dispersal of the Engellmann spruce beetle (*Dendroctorus engelmanni*) in the national forests of Colorado. In connection with these and other projects, there were important advances (1) in the field of aerial surveying and photography to determine the extent of infestation over state or region-wide areas, and (2) in the improvement of sampling techniques in ground surveys. Correlation of research and control programs continues, and the information gained in studies of forest insects in relation to their forest environment results in a continual improvement of control methods. Forest insect research has increased the possibility of developing forest management as one means of insect control.

• Extended research has been conducted in the field of chemical control of Dutch Elm disease in the eastern United States. No cure for the disease in trees already showing more than 5 percent wilt has been found, but a medicated alkalizer — Cacolate — has been found effective as a preventive. The chemical is applied to the soil surrounding trees at the rate of 15 to 20 pounds per inch (2.7 to 3.6 kg. per centimeter) of tree diameter, and has the effect of alkalizing the soil, stimulating tree vigor, and acting as an antidote to the toxin produced by the fungus (*Ceratostomella ulmi*) in the sap stream of the tree.

• In California, as in other forest areas in the western United States, it has long been known that destruction of seed-eating rodents was a necessary preliminary to successful direct seeding. A recent study was made by the California Forest and Range Experiment Station of costs of poisoning in two typical forest areas, one in the mixed coniferous forests of the west slope of the Sierra Nevadas and the other in the ponderosa and Jeffrey pine (*Pinus jeffreyi*) type of the eastern side. In the former, the bait was distributed three months before seedfall, and 707 new sugar pine seedlings (*Pinus lambertiana*) per acre were established. In the latter case, the bait was distributed just before seedfall, and nearly 7,000 ponderosa and Jeffrey pine seedlings were established, leading to the conclusion that the timing of poisoning is important. Sodium fluoroacetate and thallium sulfate were used in treating oat groats. The baits were distributed in pinches every 15 feet (4.6 m.) along lines from 50 to 65 feet apart, (15.2 to 19.8 m.) being placed at centers of rodent activity. Costs of poison were 46 cents per acre ($1 10 per ha.) on the west side and 26 cents per acre ($ 1 60 per ha.) on the east side, the difference being made up by the difference in area treated per man-day. Experience has shown that it is necessary to treat a belt around areas intended for seedling establishment in order to prevent, or at least slow down, re-invasion by rodents from surrounding areas. It is clear, therefore, that the cost per reproduction area will depend on the size of the area and consequently on the surrounding protective belt.

Mensuration and Surveying

United States of America

• Forty years ago teaching of forest mensuration in the United States necessarily dealt, on the one hand, with European methods, and on the other with the esoteric native arts of the timber cruiser and the mysteries of the board foot as drawn up in a multitude of log rules. The relative precision of European methods for measuring tree and area volume and growth in cubic measurements, and the relative lack of precision of American methods, using the board foot, made a strange and often contradictory team. Experience has shown that some methods which, while suited to managed European forests, were ill-adapted to the typical ragged, abnormal and partially-stocked uncut, or partially cut, forests of the United States, and to the residual or remnant stands encountered by the forester. Thus, it was necessary to devise methods suited to native conditions, and research and experience have been increasing at an accelerated rate, particularly during the past fifteen or twenty years. Revised editions of two joint publications, *Forest Mensuration* by D. Bruce and F.X. Schumacher and *Forest Mensuration* by H.H. Chapman and W.H. Meyer, were put out in 1950 and 1949 respectively by the leaders of research in this field.

Bruce and Schumacher have done notable work in applying mathematics to the problems of forest mensuration ; both are skilled mathematicians, trained foresters, researchers and teachers. Their approach is through explanation of the tools of forest mensuration rather than through description of the innumerable ways in which they may be employed. They deal, first, with the methods of direct measurement of diameter, height, volume and age, giving the mathematical basis for the various methods and assessing their degree of accuracy. They discuss the methods of making direct estimates by sampling and the various kinds of averages and their use ; measures of dispersion and the normal curve of error ; the standard error ; application of the normal curve and the different sampling methods. Part III of their book, which fills more than half the volume, covers the many more recent methods of making indirect estimates, based on one or more independent variables, and includes also critical discussions of the methods of timber cruising, including those used in the National Forest Survey, and a brief a[illegible] of the use of aerial photos in cruisi[illegible] The last part of the book d[illegible] with problems and methods of predicting growth and yield of even- and uneven-aged stands.

Chapman and Meyer emphasize the economic approach, taking the view that timber utilization and products form the basis for all forest mensuration. They relate mensuration techniques to the silvicultural characteristics of trees and stands on the one hand, and to the demands of forest management on the other. Discussion is divided into : (1) cubic, board and piece measures ; (2) construction and use of volume tables for the entire tree ; (3) measurement of standing trees and determination of area and volume ; (4) measurement and prediction of tree growth and stand increment. The elementary graphical, mathematical and statistical techniques are summarized in two separate chapters. The authors have done much original work in forest mensuration, particularly in methods of cruising and sampling, and have had considerable teaching experience in measuring and predicting growth and yield.

While it is true that practices which are admirable in one country may not fit the problems and needs of another, it may well be that these texts can add valuable details on methods and practices to FAO's necessarily general description of the methods and criteria for making national forest inventories, and so may find use outside the country for which they were written.

Forest Management

United States of America

• A study made to determine the commodity drain on forests in the Northern Rocky Mountains, accounted for by the mining industry, includes the estimation that in extracting 4.8 million tons (4.4 million m.t.) of metallic ores in this region in 1949, the mining industry used 4 million cubic feet (113,200 m³) of round timber approximately one cubic foot (1 m³ to 32 m.t.) of timber to each ton of ore. Douglas fir (*Pseudotsuga taxifolia*) is the preferred species and made up 59 percent of the total round timber, lodgepole pine (*Pinus contorta*) made up 23 percent, and larch 18 percent. About 8 percent of the total was dead timber - all lodgepole pine.

• An U.S. Federal law set a minimum wage of 75 cents per hour in January 1950. A study of its effect in the southern sawmilling industry showed an immediate and sharp increase in the percentage of workers receiving the minimum wage which rose from 31 percent to 92 percent. Before the law came into effect, 69 percent of the workers

received from 50 to 75 cents per hour. Few industries were affected more strikingly than sawmilling.

In 1949, 17 of 22 selected sawmill occupations fell within the narrow range of 57 to 70 cents per hour. Within this range, wage increases were heaviest in the south-east — 13 cents per hour — and least in the border states — 4 cents per hour. Lumber prices increased substantially during the period of wage adjustments because of the building boom, but it is clear that the increases were greater than required to adjust wages. There was a slight decrease, amounting to 2 percent, in sawmill employment between the end of 1949 and early 1950, but it is difficult to attribute this to the establishment of the minimum wage law. During the period, between 1 and 2 percent of the sawmills went out of business, principally because of a shortage of logs, but the number of new mills exceeded the number closed. The law has also apparently caused many firms to reduce scheduled hours of work from more than 40 to 40 per week. This has had the effect of reducing overtime pay and thereby absorbing part of the cost of the new law. The law has also apparently stimulated a trend towards mechanization, particularly among the larger firms, but less in the smaller ones where mechanical devices are not suited to the scale of operation.

• The problem of deer management on forest lands continues to engage the attention of foresters and wildlife experts in the United States. In general, deer populations reach their maximum in areas of disturbed vegetation, that is, in secondary stages of plant succession. These stages are produced by logging, fire and grazing. Thus control of plant succession is necessary where a major purpose of land management is to produce deer. Controlled burning is recognized as one means of inducing the desired successional stage, but the danger in the use of fire is considerable and not always readily controlled. On arid areas, control of grazing, both by domestic livestock and deer, usually in combination, is the tool which should be used and the best intensity and combination of animals is a highly local determination which must be made in each particular case. Nevertheless, there is a point of optimum stocking which can be determined by research and experience. Considerable progress is being made in the management of individual herds through controlled take of both bucks and does, despite the persistent prejudice against the taking of the latter, but the co-ordinate method of control through predation is receiving relatively little systematic attention. Thus much additional work remains to be done, particularly in the deliberate management of plant succession and in the intelligent use of predation before deer herds are brought into permanent balance with the range available.

Union of Soviet Socialist Republics

• The Ministry of Forestry in a report issued in January 1951 on the work accomplished during the post-war five-year period, 1946-1950, summarizes progress in its various activities in the table below:

Type of Work	Period 1946-1950	
	Volume of Area	Percentage Fulfillment of Plan
Preparing plans for unmanaged forest land (in 1,000 ha.)	56 384	101
Exploring and mapping by air, and aerial photography of little known forest regions (in 1,000 ha.)	190 000	106
Cultural operations (thinnings, improvement cuttings, etc.): area covered (in 1,000 ha.)	9 882	115
volume removed (in 1,000 m^3)	100 460	108
Sowing and planting of forests (in 1,000 ha.)	1 892	108
Establishment of new forest nurseries (in ha.)	32 801	106
Care of plantations (in 1,000 ha.)	9 766	101
Aid to natural regeneration (in 1,000 ha.)	1 010	1 000
Ground preparation for forest nurseries, plantations, etc. (in 1,000 ha.)	2 520	105
Seed collection (in tons)	95 476	105
including oak acorns (in tons)	80 561	104

From 1951 onwards all work connected with organizing and preparing management plans is to be carried out by one central organization for the entire U.S.S.R. to be known as "Lesproyect" (Forest Project). This organization includes 10 timber trusts, 44 field teams and seven regional offices, with over 3,000 trained foresters who are responsible for the quality of both field and office work. Management plans have been prepared for the five-year period and put into effect on 800 forest units; during 1951, it is expected that this number will increase to 1,200.

Marketing and Trade

United States of America

• An analysis has recently been made in the United States of the probable character of future wood markets, and the bearing of the speculative conclusions reached on current forest management, since management must plan a considerable time ahead to produce the materials to meet market requirements. The pulp and paper industry has expanded spectacularly and further expansion is expected, but this industry does not provide an outlet for high priced stumpage. The manufacture of rayon and other wood-derived plastics has increased, but even if there were a further increase of 400 percent, total wood consumption would only increase by one percent.

The production of wood sugars and derived chemicals by wood hydrolysis is technologically feasible, but only very low-priced wood, available within a short hauling distance of the manufacturing plant, is likely to make it an economical proposition. Although total lumber production has increased 19 percent during the last decade, it has been rapidly displaced in many of its traditional markets. About three-quarters of all lumber is used in some form of construction, the remainder being divided between shipping use and manufacture. The use of lumber in the construction of new residential buildings, now consuming over one-third of total production, is the most important single market for lumber. Research has shown that the buying price of lumber is high in relation to competitive materials, as is, in many cases, the cost of fabrication and fitting in the finished building. Owing to these cost considerations, the size of houses and the amount of lumber used has declined substantially, and new types of houses with non-wooden frames are becoming more common. To compete technologically with alternative materials, the industry is faced with a major undertaking in research and in working out methods for producing suitable lumber at lower unit costs to the consumer. The industry at present supports research at only about one-third the rate of some competing industries.

The tentative conclusions reached are that lumber consumption is likely to decline, and the higher the price, the more rapid the downward trend. Present technologies in pulping and wood hydrolysis are not likely to take up the full slack in the volume of wood consumption, and in any event these processes are based on lower wood costs than lumber production, and thus the market for high-priced wood is likely to contract. If it is correct to conclude that there will be a low-priced market in the future, then the forest manager must keep his costs per unit of volume down and concentrate on quantity, not quality. This is particularly true if the future market is for fiber-wood-cellulose rather than for sawlogs, and may mean intensive forestry with the emphasis on cost as the controlling factor. It also seems clear that integrated forest industries will be an essential of large-scale commercial forestry in the future, and that the production of wood on a large scale will be at a low cost, basic raw material for conversion by industries being organized into a single interdependent unit.

Forest Products and their Utilization

Australia

• The Standards Association of Australia has re-issued its publication *Australian Standard Nomenclature of Australian Timbers*. The Association was established in 1929 under the aegis of the Commonwealth and state governments for the promotion of standardization and simplified practice, and is supported by state governments, universities, industrial and commercial organizations. Committees representing interested agencies are established from time to time to prepare standards.

The confusion among common names, trade names, and scientific names for commercial timbers is well known. The Association has, first, decided on standard trade common names; second, on the standard trade reference name or botanical name; and, third, other common names applied to different botanical and standard common names. A separate table for each is arranged alphabetically to enable concordance with the two other names. A complementary table gives the areas in which the species occurs and, if an exotic found in plantations, specifies the fact. It is hoped that, by adopting standard common and botanical names, other names now in use will become obsolete and confusion will be reduced. The Association has also issued in provisional form and circulated for comments proposed standards for waterproof plywood and for plywood for general purposes which, after comments have been taken into consideration, will be published. In earlier years, the Association issued standards on such subjects as terms and definitions used in timber grading rules, grading rules for milled flooring and grading rules for milled lining.

Union of South Africa

• *Eucalyptus saligna*, a native of New South Wales and southern Queensland, has been extensively planted in South Africa during the last 40 years, primarily with the object of producing mining timbers on short rotation. The tree produces a generally useful type of timber, but difficulties in sawing and seasoning are considerable since the outer portions of the stem are in tension and the inner portions in compression, resulting in a strong tendency to split and warp. The time of felling is of little importance to the quality or behavior of the seasoned wood. In general, large logs split more than smaller ones, and to minimize splitting, logs should be sawn in the greatest practicable length and should be converted rapidly after felling. It is advisable to cut or edge to width only after seasoning. The most effective seasoning practice is to follow a month to six weeks' air-drying by about five days in the kiln, putting the air-dried wood in at about 20 percent moisture content. On account of the very high green moisture content, shrinkage across the grain ranges from 3 to 11 percent, with heavier woods averaging 7 percent and lighter woods 5 percent. The worst defects are the natural defects, such as dead knots, and to produce the best logs, pruning of young stands is desirable, especially where maximum utilization of the lumber is required. From 100 cu. ft. (2.8 m^3) of round logs the following yields may be expected: 55 cu. ft. (1.6 m^3) of square sawn one-inch (2,540 cm.) green boards: 41 cu. ft. (1.2 m^3) of dried saleable timber when cut to random sizes: 30 to 35 cu. ft. (0.8 m^3 to 1.0 m^3) if cut to a few stock sizes; 18 to 20 cu.ft. (0.5 to 0.6 m^3) of wood cut to a constant dimension, such as flooring; 28 cu.ft. (0.8 m^3) of rough sawn timber of sizes for building, if cut from logs of 10 inch (25.4 cm.) diameter.

Although its greatest use is as a mine prop, *Eucalyptus saligna* has been used for poles, fence posts, for fruit boxes, as seasoned boards, as a substitute for imported softwood, and as pulpwood. It produces a good yield of comparatively short-fibered pulp of only moderate strength and, if used in a paper requiring strength, must be mixed with the pulp of other species. Since larger sizes of the tree will continue to compete with imported timbers, it is unlikely that larger trees will acquire a greatly increased value in the future. It is used as a substitute timber primarily in the young fast-grown condition.

United States of America

• The Forest Products Laboratory of the Yale School of Forestry is conducting a series of investigations on the properties of tropical wood on behalf of the Office of Naval Research. One project deals with the weathering characteristics of 27 selected hardwoods from Brazil, British Guiana, British Honduras, Honduras, Nicaragua, Panama, Puerto Rico, and Surinam. The selected species are compared with three control species — American white oak, Central American mahogany and teak — after exposure in painted and unpainted standard samples for 18 months. Conclusions are that the deterioration of wood, when exposed to weather, is a property which is difficult to predict or correlate, since unsuccessful attempts have been made to correlate the various properties of the woods. However, further investigations are planned. As a result of the tests, the woods are classified into four groups — excellent, good, fair and poor — both for unpainted and painted specimens.

Another study is concerned with the steam-bending properties of 16 selected tropical woods compared with American white oak. The project is important since few American species are well adapted to the steam bending process. Results indicate that the majority of woods with excellent steam-bending characteristics have a ratio of toughness to fiber stress in excess of 0.03, and that this relationship is useful for preliminary screening of woods to be tested.

• Acid treatment of freshly chipped streaks of slash pine (*Pinus caribaea*) and longleaf pine (*Pinus palustris*) in the south-eastern United States has now been fully established as an economical and desirable technique in the production of naval stores. A season's work of 16 streaks laid on at two-week intervals will produce at least as much gum as 32 regular, deep and untreated streaks laid on at one-week intervals. By the new method, the working life of the face, is almost doubled and each chipper can work almost twice as many faces. The acid increases and prolongs the gum flow but does not directly stimulate the manufacture of more gum. Streaks are cut through the bark only to a width of $^1/_2$ to $^3/_4$ of an inch (1.270 cm. to 1.905 cm.) a solution of 50 percent by weight of sulphuric acid is sprayed on the freshly cut face at the rate of one quart of acid to 1,000 streaks. Special equipment needed are a bark hack, a plastic squeeze sprayer, and an acid resistant cup cover. The cost of the equipment is small. It is necessary to remove all the inner bark in cutting the streak, but it should not be cut any deeper than the bark. Acid should be applied immediately. Too much acid will reduce gum yields and should not be applied during the winter. When the gum is processed in steam plants, there is no degrading of the resin. When the gum is processed in a fire still, acid-treated gum should be mixed with untreated gum to prevent discoloration and subsequent degrading. Best results are obtained by working trees no smaller than nine inches (22.86 cm.) in diameter.

• The Forest Products Laboratory, Madison, Wisconsin, has recently studied the technical feasibility of utilizing various wood waste for the production of insulating type building boards. These boards are used increasingly because of the low material cost and large sheet size that reduces fabrication costs, not only for thermal insulation for exterior walls and roofs, but as surfacing materials for interior use as walls, partitions and ceilings, as lath base for plaster, and as sheathing. In general, building board plants must have a minimum of 100 tons of raw material per day to operate economically, and this volume of raw material is seldom available as waste from other wood-using plants.

For the purposes of the study, experimental boards were produced at

the Laboratory and were tested for strength and other properties in accordance with federal standard specifications, with five classes of material considered. The waste materials tested included: (1) sawdust, solid wood waste and mixtures; (2) unprocessed sawdust; (3) materials from thinnings and cull trees; (4) pulp mill wood waste. Hydrated binder pulps and repulped old newspapers were used as a binder. In general, the products were marginal. Some of the boards made from sawdust and chipped solid wood with binders met requirements for all five types of insulating board, but other boards were suitable for only one or more types. Most of the pulp mixtures made were too slow in water drainage for use on conventional board mixtures and required modification of equipment. For each of the four groups of waste material tested, details have been worked out about materials used, the method of processing, methods of board formation, testing procedures followed, test results on the boards in terms of strength and moisture exposure effects, and manufacturing limitations where the latter exist.

• The North-eastern Wood Utilization Council, Inc., of New Haven, Connecticut, recently brought together in conference leading authorities on chipped wood production and its uses with the results that information on experience to date is now readily available. Attention is being given the subject by equipment laboratories and manufacturers, by researchers and executives in the wood-using industry, by foresters employed in several states and by the national forest services of Canada and the United States, and finally by state agricultural colleges and experimental stations. The practice of intensive forestry in the northeastern United States and in southeastern Canada would be greatly facilitated if ways could be developed to dispose of waste material resulting from cultural operations and from the utilization of forests for lumber and pulpwood. For example, if all dairy farmers in the state of Vermont alone were to use only wood chips for bedding, there would be an outlet for pole wood material removed by improvement cuttings from two million acres.

The profitable marketing of chipped wood is still largely an unsolved problem, but there are several real possibilities, including the use by farm co-operatives of chips for bedding, mulch and soil amendment, and the use of chipped wood for fuel with mechanical feed. Chipped wood is not desirable for ordinary paper making, since it contains bark, but it can be used in quantity for kraft paper, roofing and insulation, some types of wallboard, and for various wood chemical operations such as charcoal production. A great deal of information is now available on the suitability of wood chips from waste material for these various industrial uses, the species that can be used, the size of chips, and similar technical data. In addition, much research has been done on the utilization of wood chips of different sizes and from different species for the several forms of agricultural use which potentially offer an enormous market if chips can be delivered at below the cost of competitive materials.

No portable chipper now available is fully suited for handling all the waste material which foresters would like to see converted to beneficial use, since none can handle the entire range of sizes produced in cultural operations and in forest utilization. Full-scale field tests of production rates and costs, and the uses to which the chips are put, have been reported for several types of chippers, and further tests will be made as improvements in machine design occur.

The wide coverage of the research already done and still being done, the wide participation of experts approaching the problem from various angles, the synthesis of effort attained through the Council — all combine to justify the hope that success will be attained in this field in improving the utilization of forests, and thereby in opening the way to a higher and more profitable level of forestry. The whole program is likely to be of importance to other countries which have not yet solved the problem of waste.

• The hydroscopic quality of wood is one of the properties limiting its use in aircraft through the dimensional changes which occur when it is exposed to varying conditions of humidity. As one of a series of studies made by the Forest Products Laboratory, Wisconsin, to improve the dimensional stability of wood, a new method of treating woods with chemical vapors was devised.

This was at first principally intended to improve their dimensional stability when exposed to severe and prolonged high humidity, or when immersed in water over extended periods. The method involves treatment with vapors of a solution of acetic anhydride and pyridine. The pyridine is used to swell the wood, and the acetic anhydride to replace the relatively hydroscopic hydroxyl groups in the wood with less hydroscopic acetyl groups. The pyridine also catalyzes the acetic anhydride reaction. The acetylation thus accomplished leaves the wood in a permanently swollen condition by means of the bulking action of the acetyl groups within the cell walls. About 20 percent acetylation reduces shrinkage approximately 70 percent compared with untreated wood. Limited tests indicate that treatment is permanent. Resistance to decay and shipworms is improved, and a few tests indicate that strength properties are not impaired and may in some cases, be improved.

Forest Policy

Australia

• Terms of reference for the West Australian Governments' Royal Commission on the timber industry were recently released. The Executive Council has approved the appointment of Mr. G.J. Rodger, Director-General of the Commonwealth Forestry and Timber Bureau, as Royal Commissioner. The terms of reference, which cover all phases of the industry, as recommended to Parliament by a Joint Select Committee, are: forest resources and potential, including softwood development; demands on such resources from within and without the state and the extent to which, and the manner in which such demands should be met; forest valuation and finance; forest regulation and administration; forest utilization and harvesting of timber crops, including dead timber; saw milling and fire prevention and protection; forest policy, including the granting and conditions of existing and future permits; forest legislation and regulations; and remedial action in relation to these matters.

New Guinea

• Timber resources in Papua and New Guinea will shortly be exploited on an ambitious scale by a company representing jointly the Australian Government and the Bulolo Gold Dredging Company. Despite very extensive stands of timber in the country, timber imports through Port Moresby on the southern coast have been considerable. Hitherto, however, lack of sawn timber has hampered the development of the territory.

The Australian Minister of External Affairs has defined timber policy in New Guinea as "orderly development on sound forestry principles with adequate provision for reafforestation; grant of emergency permits; disposal by tender of timber areas; development of the valuable pine stand in the Bulolo Valley and payment of royalties on all timber cut."

Plywood, veneer and sawn timber are the main objectives of the Bulolo Valley project. But before the company starts operating, plywood specialists from Canada and other timber and milling experts are to make a full investigation of the technical and economic potentialities.

Southern Rhodesia

• A new Forest Act was promulgated in Rhodesia in 1949. It recognizes indigenous forest as "reserved forest" and provides measures for its protection. It also restricts the rights of miners to damage forest unduly on reservations made for the mining industry. It maintains

principles already established for control of forest lands, for the setting aside of demarcated forest and nature reserves, protection of particular trees, regulation of trade in forest produce and for the control of prices.

The National Parks Act was also passed in 1949 under which management of national parks and game reserves was shifted from the Forest Department in 1950. The Forestry Department administers 1,301,000 acres, (526,500 ha.) and additional reservations have been recommended. Public land suitable for soft-wood plantations is now scarce, and studies to obtain an additional 35,000 acres (14,200 ha.) of suitable land are under way. The annual planting rate will be increased to about 3,000 acres (1,200 ha.) within two years. Efforts are being made to attract needed native labor by improving living and working conditions. Interest in private forestry is expanding, and there are now nearly 44,000 acres (17,800 ha.) of private lands.

A new sawmill is to be constructed, and a pressure preservation plant to replace the existing open tank system is probable. Although revenue is currently only about one-half of total expenditure since forests are still in the process of establishment, it is estimated that the revenue will be 2¼ times the present revenue by 1955.

United States of America

• A considerably expanded program of range reseeding is contemplated under a 15-year program for re-forestation and re-vegetation of national forest lands authorized by Congress in 1950. About 4 million acres (1,618,800 ha.) of the national-forest range is to be reseeded to palatable forage plants. Through reseeding, this land can be made to support from two to ten times the number of livestock now carried. About 333,650 acres (135,000 ha.) have already been reseeded and restored to productive conditions.

The most important Federal legislation concerning forestry enacted during the past year was the Co-operative Forest Management Act (Public law 729-81 Congress). This law which became effective 1 July 1951, authorizes the Secretary of Agriculture to co-operate with the different states to enable them to provide technical services to private forest land-owners and operators, and processors of primary forest products. The technical services include assistance in management of forest lands and the harvesting, marketing and processing of forest products. This Act replaces the Norris-Doxey Co-operative Farm Forestry Act of 18 May 1937, which was repealed in 30 June 1951. The Co-operative Forest Management Act sets up a National Advisory Board of state foresters to deal with the Federal Government on matters covered by the Act. To carry out the provisions of the Act, annual appropriations are authorized to the sum of $2,500,000.

A report entitled *Natural Resources Activity of the Federal Government*, prepared for the Task Force on Natural Resources of the Hoover Commission, is both a ready source of information and a striking illustration of the extreme difficulty of preparing a really balanced descriptive and analytical account of this complex and highly controversial field. The primary purpose of the Task Force was to put forward recommendations on reorganization of the widely-scattered and unco-ordinated programs, dispersed among a dozen or more agencies. The most persistently controversial policy question is whether major responsibility for renewable resources should be placed with the U.S. Department of Agriculture, long the home of the Forest Service and Soil Conservation Service, or with the U.S. Department of the Interior, the residence of the Bureau of Land Management, Park Service, Fish and Wildlife Service, Office of Indian Affairs and Bureau of Reclamation.

The unyielding opposition of the U.S. Department of Agriculture and its Bureaus to transfer responsibility to the U.S. Department of the Interior is based on two major and irreconcilable differences in philosophy, legal principles and practice between the Departments. The U.S. Department of Agriculture not only retains public lands already under sound management in the National Forests, but is constantly increasing the area. The U.S. Department of the Interior's public lands in the grazing districts, which make up the great majority of lands for which it is responsible, are subject to alienation. This problem is one of permanence or impermanence in public ownership and affirmative management. In the second place, the policy and practice of multiple-use applies to the national forests, whereas by law a single purpose — grazing, recreation, wildlife and fish, Indian lands — is written into the laws dealing with the different forms of withdrawals and reservations, which govern the operations of the separate bureaus. Experience to date shows beyond doubt that: (a) public ownership and technically competent management are indispensable to the conservation of many, if not most, lands possessing forest, range, watershed, recreation and wildlife potentialities, and (b) multiple-purpose management is the only way in which the national needs for these separate resources can be satisfied.

The report, valuable as it is as a source of statistical and legal data, does not identify clearly these vital and clashing conflicts, nor does it analyze adequately the degree to which each of the various forms of public ownership serves or fails to serve the true national interest by application of sound fundamental principles. For example, multiple use is mentioned but not defined in a brief paragraph of a two-page description of the national forests whereas the space allotted to each of the U.S. Department of the Interior's agencies is many times greater. The fine research program of the Forest Service, as a basis for technically sound management, is barely mentioned. By structure, allotment of space, and by omission, the over-all effect of the report is to emphasize the U.S. Department of the Interior's types of administration, without reasoned and critical comparison with that of the U.S. Department of Agriculture.

The Task Force recommended consolidation of renewable resource activities in the U.S. Department of the Interior, a proposal rejected by the Commission which recommended major shifts of agencies, areas and functions to the U.S. Department of Agriculture. A referendum vote of the Society of American Foresters has recently approved the Commission's view.

The vigorous debate in the United States on the controversial question of the most effective organization of federal activities dealing with natural resources is of continuing interest to nations which have yet to develop fully their own governmental structure of organization in this important field.

Union of Soviet Socialist Republics

• For the first time since its organization the Ministry of Forestry issued in January 1951, on the occasion of the conclusion of the Five-Year Plan (1946-1950), a revised estimate of the extent of forest land, the amount of standing timber and other related facts. The land area that comes within the jurisdiction of the Ministry is known as the People's Forest Fund. It amounts roughly to a grand total of 2,640,500,000 acres (1,068,600,000 ha.). This figure includes the 101,800,000 acres (41,200,000 ha.) of forest land allocated for use by collective farms. The grand total is broken up into:

Area covered with timber	*Ha.*	628,300,000	
	Acres	(1,552,529, 00)	62 %
Forest land not covered with timber	*Ha.*	114,300,000	
	Acres	(282,435,300)	11 %
Non-forest land	*Ha.*	270,000,000	
	Acres	(667,170,000)	27 %

It certainly also includes some additional 138,400,000 acres (55,000,000 ha.) which are either not classified or not accounted for.

The greater part of the stands are conifers which occupy about 1,215,700,000 acres (492,000,000 ha.) or 78 percent of the entire timber covered area. Mature and overmature stands classified by age groups constitute 55 percent; those

reaching maturity, 16 percent; middle aged, 15 percent; and young stands, 14 percent. The total amount of standing timber is estimated at 58,700 million m^3, of which conifers account for almost 85 percent. Since 1943, all forests in the U.S.S.R. are divided into three large groups. Group I includes forest preserves, forests of health resorts, forests on blowing soils, forest zones around industrial enterprises and cities, and shelter-belts. In 1950, the total area of such forests comprised 67,211,200 acres (27,200,000 ha.) and 3,300 million m^3, or 5.5 percent of the total amount of standing timber in the country. Cuttings in the forests of this group are confined to thinnings, stand improvements, sanitary cuttings and removal of over-mature and dying trees. Clear cuttings of any kind are strictly forbidden. Group II includes chiefly forests having a watershed protection value which are located principally in the central and western region of European Russia. Some 211,000,000 acres (85,400,000 ha.) of watershed protection forests are included in this group. The volume of standing timber in this group is estimated at 2,900 million m^3 or 5 percent of the total volume for the country. Except for strips of forests about 7 km. wide along the shores of the river Volga and its right tributaries, in which no cuttings of any kind have been allowed, (this prohibition has lately been extended to some other rivers), light commercial cuttings are permitted on the rest of the forests of this area. Group III includes all other forests not otherwise designated; these are the commercial forests of the country, open for economic exploitation and are situated principally in the northern regions of European Russia, in Siberia and in the Far East. This is by far the most extensive area covering 2,224 million acres (900 million ha.) and comprising 1,853,775 million cu.ft. (52,500 million m^3) or 89.5 percent of the entire timber reserves. In the forests of this group all forms of cutting, including large scale clear cuttings, are allowed, the sole provision being that the cut-over areas must be regenerated, naturally or artificially, within a short specified period. The volume of cutting is not limited by the annual growth, but is determined by the economic and industrial needs of the country.

Yugoslavia

• During the war, from 1941 to 1945, the timber industry in Yugoslavia suffered severely. More than 67 percent of the industry, notably the sawmills, was destroyed or damaged, while most of the undamaged mills were operating with worn-out machinery at low capacity. After the end of the war there was, therefore, reconstruction work to be done for which timber was a vital material, and for this reason the repair of the sawmills was given high priority; to achieve this, it was necessary to make use of old equipment. From 1947 onwards, out-of-date equipment was replaced by modern machinery in a certain number of sawmills, conveyors and mechanical cranes were installed and new sawmills constructed. Furniture factories were repaired and modernized, and their annual production is now 14.5 times as great as in 1947.

A modern factory for the production of prefabricated houses has recently been opened, while a fiberboard factory and another for veneering are at present under construction. The industrial consumption of timber within the country represents only 42 percent of over-all timber production. This relationship between manufactured products and timber cut is, however, improving from year to year.

Sawmills and other industrial concerns are, as a general rule, situated near the forested areas intended for exploitation. As felling operations are carried deeper into the old high mountain stands, transport becomes increasingly difficult and costly. As a result it has been necessary for certain woodworking plants, mainly sawmills, to be moved, thereby enabling "combines" to be set up with a view to a more economic utilization of timber. A careful study is now being made on the choice of sites for these "combines," bearing in mind, first, the potential yield and quality of timber of the different forests, which will feed the "combines," and second, the other factors resulting in a sound utilization of the wood. Plants which are already well placed with regard to the supply of timber itself will also need to be modernized at an early date in order to make the best use of both manpower and timber resources.

Reviews

It is the policy of FAO to review here only selected publications which appear to have a direct bearing on the current work of the Forestry Division.

World Resources and Industries. Fred W. Zimmerman. pp. 832, illus. Harper & Brothers. New York. Revised edition, 1951. Price $ 7.50.

This comprehensive volume is described as a functional appraisal of the availability of agricultural and industrial materials, and throughout the book attention is focussed on the inter-relation of resources, on the whole rather than on the parts. Its major purpose is not to enlarge the body of scientific knowledge but to render more effective the teaching to students of the social sciences in general and of economics in particular. This purpose seems to be admirably fulfilled.

In explaining the meaning and nature of resources the author, professor at the University of Texas, calls them "the bases of both security and opulence; they are the foundations of power and wealth." He examines the growing importance of tree crops and devotes considerable space to the forest and its products. He describes the forest as "a national resource; like a river system, it is a multiple-purpose resource; it constitutes a social asset of the first magnitude and it yields a great social profit which lies wholly outside the realm of business. The proper safeguarding of group interests requires that these facts be recognized; only within the frame of these basic principles should private enterprise be allowed to operate. In essence, the forest problem is one of institutional adjustment. Society must discover the particular blending of private and public action which will suit the peculiar needs of a forest."

The problem of adequacy of resources is also one of social institutions, of government policies, of international relations. In analyzing conservation as contrasted with economy, the author uses the expression "economization" to express wilful action or intent to serve the present where conservation serves the future. He describes "economization" in a price economic system as covering all efforts to improve the economic ratio of production, the ratio of output to input, or, expressed socially, the ratio of benefit to sacrifice, of utilities produced to labor expended. Conservation is any act reducing

the rate of consumption or exhaustion for the avowed purpose of benefiting posterity. If the objective cannot be gained by economy in harmony with the free play of economic forces, conservation must be imposed.

In the interest of conservation, the author says, forests should be "cropped" and not "mined." Much soil erosion is due to ignorance and carelessness. To the extent that it arises from these causes, little doubt need be entertained as to the economic justification of corrective measures.

A Water Policy for the American People. Water Resources Policy Commission. Vol. 2, pp. 801, U.S. Government Printing Office. Washington, D.C., U.S.A., 1950. U.S. $6.00.

Volume 2 of the monumental report of the President's Water Policy Commission, now available, provides the detailed story of the five western and five eastern rivers selected for intensive study. The western basins are in areas of generally low rainfall; the eastern are in more humid areas. In the west are great areas of arid and semi-arid lands; high mountains and low depressions; areas of the highest rainfall and run-off and deserts; torrential rains and droughts; the irrigated lands and half the potential waterpower; the bulk of the public lands; long distances between water-producing and water-using areas. In the east none of these is so extreme; yet each basin has distinctive major problems and groups of problems, depending on its own characteristics, history of use, status of developments and conflicts, etc. That is why these basins – the Central Valley, Colorado, Columbia, Missouri, Rio Grande in the west, Alabama-Coosa, Connecticut, Ohio, Potomac, and the Tennessee in the east – were chosen for intensive study. The basin monographs serve several purposes:

1) They indicate the major lines of policy already set forth in Volume 1. (*See Unasylva* Vol. V. No. 2., p. 95).

2) They are used to test theory and policy as to their applicability to the widely varying conditions and problems found in the whole country.

3) They provide unique reference books for students, policy makers and the great number of agencies and individuals concerned in action programs dealing with water, land and people, basin by basin.

Foresters will be gratified that the impelling urgency of better management of forest, range and watershed lands, as well as of farm lands, is so generally and realistically recognized, and that so eminent a forester as E. N. Munns (U.S. Forest Service) was able to carry out or supervise preparation of pertinent material and later to serve on the Board of Review which brought the 10 reports into their final, tightly-reasoned and admirably written form. This is a fine achievement, both for the Forest Service and its representative.

During the past half-century the Forest Service has built up a massive accumulation of knowledge – on condition of watersheds and water flows, on causes and responsibilities for defects, on practicable means for betterment, on lack of information, on stubborn inertias and glaring examples of non-co-operation – and here it may be seen how essential such knowledge is to a rational and competent plan and policy for full and permanent use of water and lands.

Most, if not all, of the "Policy Problems and their Relation to Plans for Development," which number from about 20 to over 30 in the different basins, are controversial questions treated with the maximum frankness. Many sensitive toes had to be trod upon, but the sufferers cannot justly complain of rancor or unfairness in the treading. The tone is objective, restrained and constructive, though beyond a doubt the participants held views of passionate conviction on many of the problems treated.

An almost endless list of shibboleths are depicted in their true and damaging relation to the overriding national need for conservation of land, water and people. Some will already be familiar to students of the American scene: the stubborn, selfish and so far politically effective resistance of national livestock organizations to the curbing of damaging over-grazing on national forest, grazing districts and Indian Reservation lands of western basins; the equally stubborn and effective opposition of national lumbering organizations to genuine and needed control of logging in the public interest; the availability of subsidies which put a premium on breaking the sod on lands which shortly become ruined by wind and water erosion.

Other untouchables will be less familiar. The industry's acquiescence in widespread abuse of archaic mining laws, whereby public lands, lacking realizable mineral values, may be diverted from public use to private exploitation. The irresponsible practice of dredging crop lands for a few cents' worth of gold per cubic yard, which is promptly buried in subterranean vaults, and which leaves unsightly and unproductive windrows of rock and gravel. The failure of some states to take any care of the lands granted them by the Federal Government, now sources of flood and erosion, while, at the same time, vociferously demanding great federal grants for water developments.

In total, although federal foresters were the pioneers in watershed management, they will not be able to take unalloyed satisfaction in results to date any more than others who deal with the management of land and water.

These ten monographs give in convincing detail the material summarized all too sketchily in Volume 1, and on which the bald and far-reaching recommendations were solidly based. Few will have time or opportunity to read the whole massive volume, but since the report for each basin will be issued separately, and since closely similar outlines were used for each, the student may select almost any one to learn the nature and content of this imposing and invaluable team effort.

Gall Midges of trees. (Gall Midges of Economic Importance. Vol. V), H.F. Barnes, M.A., Ph.D., pp., 270 illus. Crosby Lockwood and Son Ltd., London, 1951. 15 s.

This volume, the fifth in the series on gall midges by the same author, deals with gall midges which attack trees found in both natural and planted forests, as well as in amenity woodlands. It is, therefore, of particular interest to the forester, since it provides a source of valuable information on trees used largely for timber, as well as on ornamental trees.

As the author points out, gall midges are not by any means always serious pests of tree crops, which can often support a certain number of gall midges without suffering at all, and epidemic outbreaks, with consequent serious damage, do not occur frequently. For this reason, as is often the case with insects which only appear as pests at irregular intervals, information on their habits is not readily available; this points to the need for long-term study of the fluctuations in the number of gall midges living on trees. The author also recommends serious research into the part played by gall midge larvae living in decaying woody tissues, thereby speeding up the process of disintegration, and their effect on the economy of forest soils. Another explanation of the current lack of knowledge on gall midges, which attack forest trees, may be the long-term nature of forestry and the long life of trees — both of which tend to obscure the damage sustained in particular years. The task of first importance, therefore, which this work performs is to gather together all the relevant facts and present them in a concise and well-annotated work of reference. In the current volume, gall midges are dealt with under the trees they attack, arranged alphabetically in two sections — Coniferous Trees and Broad-leaved Trees — and contains an index to

generic, specific and popular names, as well as a plant index and a general index.

WATER VERSUS FIRE. Alva G. Neuns. pp. 36, illus. U. S. Forest Service, California Region, San Francisco, California, U.S.A., 1950. $0.20.

Published at the end of 1950, this little booklet prepared by the California Forest and Range Experiment Station of the U.S. Forest Service, presents, in a striking form the fundamental principles of "fighting forest fires with water," in the words of its sub-title. It is written in the language of the men who fight fires and each operation is described with the aid of color diagrams. It begins with a short description of the physical effect of water on fire and subsequently emphasizes the various ways of using water as a fire fighting agent. Both simple and elaborate items of water delivering equipment are described and illustrated together with the specific problems of fire suppression, which they may be called upon to meet. In addition, it contains much useful information, such as tables of discharge rates for different nozzle sizes at varying pressures, together with the appropriate pump pressure required; in all a concise and graphically presented fire fighting manual.

THE CLOSING OF THE PUBLIC DOMAIN. E. Louise Peffer. pp. 372. Stanford University Press, Stanford, California. U.S.A. 1951. U.S. $4.50.

The student of present-day American land policy and of the elaborate governmental structure, which directs or forms policy, must have many unanswered questions: why laws and programs dealing with broadly comparable lands are often in conflict; why cohesion of policy and public effort has still to be achieved. The answers to such illogical perplexities are to be found mainly in the past, and perhaps particularly during the period 1901-1910 in which Theodore Roosevelt and Gifford Pinchot led, and largely controlled, public opinion and action. What they thought and did arose from their interpretation of the then existing state of the public domain, of the role it could and should play in the nation's life, and of the urgent need for public action. As is well known, they met determined and skilful opposition, overcame apathy and stimulated active support, compromised when forced, made strong friends and equally strong enemies, and above all accomplished much, though by no means all, of their aims.

Pinchot has told his own story of the "fight for conservation," as seen by the leading participant. This new book, based on the study of a vast number of published records, deals with the same events, conditions and problems, but from the viewpoint of the historian. Whatever the validity of the interpretations and conclusions, it is well to have a detached view brought to bear on public domain history.

In working out the successive steps of preserving public forests and later putting them under administration, of establishing a reclamation program and withdrawing from the public domain land originally given to aid new builders, of withdrawing water power sites and fuel and mineral reserves and potash deposits, of developing leasing practices, of classifying arid lands suitable for homesteading — the background has always been one of conflict. There was divergence of interest between east and west, between stockman and homesteader, between monopolist and would-be monopolist and the little man.

Roosevelt and Pinchot played the game to win. However, the President's powers to withdraw were finally curbed and Pinchot was dismissed as a result of his excessive zeal. The author seems to find this zeal and his ruthless adherence to all forms of conservation regrettable, and even attributes to them some of the present-day cleavages within and outside the Government. It would seem somewhat doubtful, however, whether scrupulous and gentlemanly tactics would have been effective in the early years of this century. Although there was violent opposition in the west to forest and other reservations, there was also far more statesmanlike support for the developing program of conservation than in the east. On the other hand, this study explains why attention to the public ranges was delayed until 1934 and was then so feeble and ineffective.

It is not clear whether the author recognizes the full significance of breaking up administration of the public lands into separate agencies as a factor in slowing down the conservation movement, in weakening public support for the whole program and in setting up divergent or conflicting piecemeal programs within the structure of the Federal Government. History and not the reviewer will finally judge the accuracy of some of the author's interpretations; that they run counter to those of many who took part in the closing of the public domain is evident, but an author who labors so sturdily is entitled to express an opinion.

EXPERIMENTAL DESIGNS. William G. Cochran & Gertrude M. Cox. pp. 454. John Wiley & Sons, Inc., New York, 1950. U.S. $5.75.

Most forest research, at least until relatively recent years, has been done without the application of statistical methods or the advice of statisticians on the design of the experiments. Similarly, the apparent results have been reported and interpreted without subjecting them to the rigors of statistical testing for validity. Since, in the statement by the authors of this book, most researchers are not trained statisticians and most statisticians do not conduct research, they have prepared the book to explain the many ways in which the science of statistics can and should be applied in the initial planning of experiments, so that results may be statistically justified and methods of analyzing results may be fully explained. A good many examples, analyzed from these standpoints, are taken from the field of agricultural research, as well as from other fields. Many highly specialized methods have been devised for laying out experiments, and the relative advantages and disadvantages of each of these in dealing with particular broad types of problems are fully explained, and the mathematical and tabular material necessary is given.

In well-organized forest research today, more and more researchers are being given basic training in the statistical methods applicable to their work and, in most cases, the services of trained statisticians are available through universities or industries. While most practising foresters will probably not avail themselves of the services available from the science of statistics, the researchers can, and often should do, so as to improve the accuracy of their work. The book provides a thorough and up-to-date summary and critical analysis of developments in this highly complex field.

Planning A National Forest Inventory

Prepared by FAO after extensive investigation, this study is intended to be of service to those who may be required to plan large-scale forest inventories. The book, of approximately 100 pages, is available from FAO sales agents ; price US $1.00.

Forest Policy, Law, and Administration

This study offers those responsible for forest management and utilization the basis for the establishment and implementation of a sound forest policy. The book, of approximately 248 pages, is available from FAO sales agents ; price US $2.00.

Further studies will be forthcoming during 1952

Yearbook of Forest Products Statistics, 1951

This, the latest volume in the series, will be published shortly, presenting statistical data on forest products from over 100 countries. Bilingual English/French with Spanish supplement. Price US $2.50 ; available for local currency from sales agents listed overleaf.

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